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JPRS Report

Nuclear Developments

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SOUTH AFRICA

Environmentalists Challenge Nuclear Fuel Export Plan

51000011 Johannesburg THE WEEKLY MAIL
in English 4-10 May 90 p 13

[Article by Eddie Kock]

[Text] Plans by the South African government to sell enriched uranium on the international market for nuclear fuel have run into flak before they even get off the ground.

This week Waldo Stumpf, chief executive of the state-run Atomic Energy Corporation (AEC), announced the organization was investigating the possibility of exporting nuclear fuel from its Valindaba processing plant near Pretoria.

The news followed an AEC report last week that it was now capable of supplying fuel rods for reactors at the Koeberg nuclear power station in Cape Town. Until now South Africa has relied on imported uranium fuel to power the plant.

Energy specialist Mare Gandar, who works with the Society Against Nuclear Energy (Sane) in Pietermaritzburg, said the announcement indicates the government has committed itself to a full-blown nuclear programme and the environmental hazards that go with it.

South Africa has only one nuclear power station but the state-owned Electricity Supply Commission (Eskom) is looking at several sites around the country with another plant in mind.

The country's small but growing green movement is generally opposed to the development of nuclear technology as a means of dealing with South Africa's energy needs.

Max Sisulu, head of the African National Congress' economics desk, says a future South Africa will abide by an Organization of African Unity (OAU) resolution to keep the continent nuclear free.

Most green groups support this objective and urge the government to devote its resources to the development of alternative sources of fuel rather than the expansion of its nuclear programme. The only other countries on the continent with a civilian and nuclear arms capacity are Nigeria and Israel.

Mike Kantey, a representative for Koeberg Alert, points out that Pretoria allocates just one rand to the development of alternative fuel source for every R1,000 that it spends on nuclear research.

Koeberg Alert and Sane believe solar energy and wind-generated sources of electricity can provide viable and more environmental-friendly alternatives to the coal-fired power stations that have turned parts of South Africa into some of the most polluted zones on earth.

But the question that most vexes the greens is that Eskom and the AEC have not yet devised a method to dispose of South Africa's high-level nuclear waste.

"The Koeberg plant, like all thermal reactors in the world, generates high level waste that includes some of the most toxic substances known to man," says Henk Coetzee, of Earth Life Africa's Johannesburg branch.

Nuclear waste from Koeberg includes strontium 90 and radioactive iodine, which are potent carcinogens, as well as at least 200 kg of plutonium a year.

"Plutonium is used in the manufacture of modern nuclear warheads and is so toxic that five kilograms is enough to kill every man, woman and child on earth. In addition it has a half-life of 25,000 years. It takes this long for half of the supply to decay," says Coetzee.

"South Africa probably has more than 1,000 kg of plutonium—an element named after the god of the underworld—sitting in a tank of water at the Koeberg plant and no idea of how to dispose of it.

"Instead of spending vast amounts on developing the capacity to enrich uranium and exporting it the government should be doing research into the methods to dispose of Koeberg's, and Valindaba's, high-level waste."

Eskom acknowledges that it has not yet decided on a method for disposing of the nuclear waste being kept at Koeberg but says it still has five years to make up its mind.

In terms of an agreement with the French manufacturers of Koeberg, Framatome, South Africa must send all the waste to France for reprocessing and accept the unused toxic material for storage here by 1995.

Stumpf this week noted that the costs of producing nuclear fuel in South Africa and that existing technology would have to be replaced to make the process more cost effective.

He acknowledged that the international markets for uranium fuel were over-supplied but said prospects for export would increase in the second half of the 1990s when nuclear power generation was expected to increase.

And Eskom's chief executive, Ian Macrae, acknowledges that for the production of enriched fuel to be profitable the country's nuclear power programme has to be expanded.

Coetzee says that, in order to export nuclear fuel on a profitable basis, South Africa will have to expand its enrichment plant at Valindaba and increase the number of nuclear power stations in the country. "All this means the creation of more plutonium and other high-level wastes."

Most other nuclear countries plan to store their high-level waste in deep underground caverns dug out of

granite of other impermeable rock. This method has received international criticism.

In 1988 Sir Brian Flowers, head of the British Commission on Environment pollution, reported: "We must assume that these wastes will remain dangerous and will need to be isolated from the biosphere for hundreds of thousands of years. In considering arrangements for dealing safely with such wastes, man is faced with time scales that transcend his experience."

Coetsee says these problems are exacerbated by the volatile political context in which South Africa's nuclear programme is being developed.

"Eskom is operating on blind faith that one day the technology will exist to deal with nuclear fuel safely.

What they are in effect doing is leaving a legacy for future generations to confront."

The expansion of Valindaba's capacity will allow Pretoria to mend the weak link in its nuclear programme, says Gandar. It no longer relies on imported fuel and this has important military and strategic implications.

"South Africa must have enrichment technology in order for it to maintain the appearance that it has the capacity to produce nuclear weapons," he said.

The government has consistently used this "appearance" to gain leverage and bargaining power when it comes to dealing with foreign powers and to resist external pressures for reforming apartheid.

International Nuclear Physics Symposium Ends

OW0406141390 Beijing XINHUA in English
1338 GMT 4 Jun 90

[Text] Lanzhou, June 4 (XINHUA)—An eight-day international symposium on nuclear physics closed today [4 June] in Lanzhou City, capital of northwest China's Gansu Province.

More than 70 experts from China, the United States, Sweden, Japan and Poland attended the symposium, which was jointly sponsored by Lanzhou University and an American University.

Tsung-dao Lee, a professor of physics at Columbia University in the U.S., also attended the symposium and gave a special lecture on "relativistic heavy ion collision".

Micronuclear Reactor Contract With Iran Signed

HK1106134090 Beijing ZHONGGUO XINWEN SHE
in English 1322 GMT 11 Jun 90

[Article: "China and Iran Sign Contract for Micro-Nuclear Reactor"—ZHONGGUO XINWEN SHE headline]

[Text] Beijing, June 11 (CNS)—China and Iran recently signed a contract for the supply to the latter country of a micro-nuclear reactor. This is the second such agreement China has made with another country, the first being with Pakistan.

Reports speak of similar deals being currently discussed with Syria and Ghana. Chinese nuclear fuel technology is a great attraction to the developing countries.

China has exported a considerable amount of its uranium products for use as fuel in nuclear power stations. The gross export volume of uranium products has been increasing by more than ten percent annually since 1983.

China is especially rich in uranium resources and export of such products has earned foreign exchange for the country.

The General Nuclear Industrial Company of China predicts that the total nuclear export volume in the Eighth Five Year Plan (1991-1995) will be double that of the Seventh Five Year Plan.

Power Industry Accord Signed With France

OW1906144790 Beijing XINHUA in English
1338 GMT 19 Jun 90

[Text] Beijing, June 19 (XINHUA)—The Chinese Ministry of Energy Resources and Electricite de France (EDF) signed an agreement of co-operation in the power generation industry here today [19 June].

The agreement means continuation of the co-operation between China and the EDF.

Leading a high-level delegation, EDF Chairman Pierre Delaporte arrived in Beijing June 16. During the last two days, he has met with Premier Li Peng, Minister of Energy Resources Huang Yicheng and many other Chinese officials.

The EDF has been active in China since 1984, participating in projects covering the entire spectrum of electricity generation, including hydroelectric plants, nuclear plants transmission installations, distribution networks, maintenance, operation, rehabilitation, test laboratories, planning, economic and tariff studies, staff training and management.

In Guangdong Province, the EDF is project consultant for the Daya Bay nuclear power station and is also responsible for specific tasks during different stages of construction in the Daya Bay of the two 900 mw nuclear units cooled by sea water.

The EDF is also charged with planning studies for electric power generation and transmission in Sichuan Province, the load forecast study for east China, and tariff studies for the east China network.

After today's signing ceremony, Delaporte told the Chinese press that by the year 2000 China will have an installed capacity of about 300,000 mw, and annual generation, currently at 500 billion kwh, will increase threefold by the end of the century.

He said that China is already the third-largest producer of electricity in the world, and several factors have worked in her favor as China has plentiful coal reserves and enormous potential for hydroelectric power.

Delaporte was confident that the EDF's long-standing relationship with the Chinese power industry will continue to bear fruit.

"We are committed to assisting China in meeting its energy requirements in the next decade and beyond," he added.

Testing Completed on Heat-Supplying N-Reactor

OW0105173190 Beijing XINHUA Domestic Service
in Chinese 0745 GMT 22 Mar 90

[By reporter Huang Wei (7806 1218) and correspondent Ma Xuquan (7456 2700 3123)]

[Text] Beijing, 22 Mar (XINHUA)—The 5-billion-watt low-temperature heat-supplying nuclear reactor designed and made in China stopped supplying heat today. It has now supplied normal heat for exactly 100 days. This figure indicates that China stands at the forefront internationally in the practical application of technology in the realm of low-temperature nuclear heating.

The use of nuclear energy to supply concentrated heat in urban areas has been a topic of international study for more than a dozen years. Compared with heat obtained

from burning coal, nuclear heat has the special features of coal conservation, lower production cost, and no environmental pollution.

The 5-billion-watt low-temperature heat-supplying nuclear reactor designed and built by the Nuclear Energy Technology and Research Institute of Qinghua University is the world's first shell-type low-temperature reactor that has gone into operation with an inherent safety factor. It has adopted an advanced integrated structure of natural cycle. It puts the heat exchanger and the reactor core together in a pressurized shell as an integrated body, thus improving the safety factor and the reliability of the reactor. For the transmission system of the control rod, the engineers, for the first time, used the theory of hydraulics to raise and lower the rod. Such a device has the merits of a longer life, tighter seal, and lower production cost.

Not long ago, Dr. (Frehl), world-famous expert in the field of nuclear energy in the FRG, sent a message of greeting to China. He said the completion of this 5-billion-watt reactor "is not only an important milestone in the international development of heat-supplying nuclear reactors, but also a milestone in tackling the issue of pollution."

Plans for More Nuclear Power Plants Announced

*HK2205025490 Beijing CHINA DAILY in English
22 May 90 p 1*

[By staff reporter Li Hong]

[Text] China is planning to speed up the construction of nuclear power plants in an effort to make up for the country's energy shortage, a senior government official said yesterday.

The China National Nuclear Corporation (CNNC) is targeted to have plants supplying 6,000 megawatts of nuclear power generators in operation by the end of this century. Two plants, one near Shanghai and one in Guangdong Province, are already under construction.

In addition, CNNC hopes to have additional plants with a total capacity of another 6,000 megawatts under construction, said CNNC Executive Vice President Chen Zhaobo.

Chen said the first Chinese-designed nuclear power plant, the first phase of the 300,000-kilowatt pressurized water reactor Qinshan Station, will generate electricity by the beginning of next year, which will be followed by other plants in the country's coastal provinces.

And the country hopes to master the design, construction, assembly, testing and management of a 600,000-kilowatt pressurized water reactor plant, which is likely to be the mainstay of the country's nuclear power development.

Also, according to Chen, the country is pinning much hope on finding new uranium deposits and increasing its

uranium reserves. To date, more than 200 deposits of different types have been discovered.

It is expected that China's nuclear power will be developed at a much quicker pace, and efforts on uranium prospecting and exploration will be furthered in the 21st century.

Chen spoke at the annual technical committee of the Asia and Pacific uranium meeting yesterday in Beijing.

"The current uranium over-supply in the world market, caused by oil price reductions and the negative effect of the Three Mile Island and Chernobyl accidents, is a temporary phenomenon," said Chen who is also a renowned nuclear specialist.

Sponsored by the International Atomic Energy Agency (IAEA) and hosted by CNNC, the session was attended by more than 100 uranium experts and officials who came from 18 IAEA members including India, Pakistan, Japan and South Korea.

During the meeting, which will last three days, international specialists on uranium geology are scheduled to discuss the characteristics and important recognition criteria of uranium deposits in the different geological environments in the Asia-Pacific region, and then seek out the implications for resource evaluation and exploration in the area.

It is learned that Chinese uranium geologists will present 14 out of the total 30 papers, systematically introducing the uranium geology in China and the research results obtained in the past years, which is thought "of value for reference to the experts of other countries, particularly Asian states neighbouring China."

China started uranium prospecting and exploration in 1955. Now it is home to a complete set of uranium prospecting and exploration methods and an experienced exploration team of more than 60,000.

Landmark Reached in Building Nuclear Power Plants

*HK0206053390 Hong Kong ZHONGGUO TONGXUN
SHE in English 0105 GMT 2 Jun 90*

["China Completes Nuclear Reactor Element Project"—ZHONGGUO TONGXUN SHE headline]

[Text] Chengdu, June 2 (HKCNA)—The provision of reactor elements by a Sichuan fuel factory for China's first 300-megawatt nuclear power plant at Qinshan in Zhejiang Province represents a landmark in the country's capacity to build nuclear power stations on its own.

Known as Project 728, the elements, which have been tested and approved, were, according to the "SICHUAN DAILY," produced by the Yibin Nuclear Fuel Element Factory in Sichuan Province in the southwest of the country.

Since May 1975, technicians at the factory have overcome more than 170 major technical problems before finally mastering the process. Trial production started in late 1987.

The first batch of fuel components and related parts were tested and approved by the state in late December last year after two years of trial production. Deliveries for the first reactor will be completed by the end of July this year, thus opening a new chapter in China's nuclear energy development.

First Pulsed Reactor Installation Approved

*OW2506014190 Beijing XINHUA Domestic Service
in Chinese 0013 GMT 21 Jun 90*

[By correspondent Zhai Peitian (5049 1014 1131)]

[Text] Chengdu, 21 Jun (XINHUA)—The first pulsed reactor installation designed and successfully manufactured entirely by China recently passed state examination and nuclear safety evaluation in Sichuan.

The pulsed reactor is a type of installation that has wide applications in isotope production, neutron photography, the study of nuclear physics and neutron physics, and irradiation experiments. At present, only a very small number of countries in the world have this type of installation. The pulsed reactor developed by our country is the result of successful research and manufacture by the First Research and Design Institute of the Ministry of the Nuclear Industry. It includes exhaust emission, a system of waste water collection, storage, and operation, and other safety measures. It also draws on experiences acquired by foreign countries in pulsed reactors.

Diplomat on Nuclear Proliferation Responsibility

*OW2206113390 Beijing XINHUA in English
1444 GMT 21 Jun 90*

[Text] Geneva, June 21 (XINHUA)—A Chinese diplomat said here Thursday [21 June] that the most effective means of preventing the proliferation of nuclear weapons was the fulfillment of the special responsibility

by the United States and the Soviet Union in halting their nuclear arms race and effecting nuclear disarmament.

Hou Zhitong, the Chinese ambassador for disarmament affairs, urged the two superpowers which have the largest nuclear arsenals to immediately put an end to their nuclear arms race, take the lead in stopping the testing, production and deployment of nuclear weapons and reduce all kinds of nuclear weapons they have deployed both on their own territories and abroad.

"Only in this way can genuine conditions be created for the realization of the fundamental goal of ending all forms of nuclear proliferation and effecting complete disarmament," he said.

He was speaking at a colloquium on the non-proliferation of nuclear weapons. The colloquium, sponsored by Prince Sadruddin Aga Khan, a special consultant to the United Nations secretary-general, was attended by academics, experts and diplomats from some 50 countries.

Ambassador Hou stressed that nuclear-weapon states should undertake not to use or threaten to use nuclear weapons against non-nuclear-weapon states. This commitment is of great significance to nuclear non-proliferation, he said, because "asking the non-nuclear-weapon states to forgo the choice for nuclear weapons while refusing to undertake to provide necessary security assurance for them would put these countries into a discriminated and unequal position."

He also indicated that the non-proliferation of nuclear weapons should not affect or harm the legitimate right of all countries, particularly the developing countries, to utilize nuclear energy for peaceful purposes.

The ambassador reiterated that China does not advocate, encourage or engage in the proliferation of nuclear weapons and oppose nuclear proliferation in all its manifestations.

JAPAN

Report on Future of Nuclear Power Supply by 2010

*OW1306082990 Tokyo KYODO in English 0814 GMT
13 Jun 90*

[Text] Tokyo, June 13 KYODO—Nuclear power should account for 43 percent of the total electricity supply in 2010, up from the current 26.6 percent, a government report said Wednesday. In terms of per-hour electricity generation rate, nuclear power's share should rise to 27 percent in the next 20 years from 17.4 percent, it said.

The share of coal-generated energy also should increase, to 15 percent of the electricity supply from 9.5 percent, while that of crude oil should decline to 10 percent from the current 29.2 percent, the report said.

The report, prepared by the Electricity Utility Industry Council, an advisory panel to the Ministry of International Trade and Industry (MITI), predicted the total electricity demand will surge some 66 percent, to 1,080.0 billion kilowatt-hours in 2010 from 672.3 billion in 1988. And nuclear power should be responsible for 473 billion kilowatt-hours in 2010, it said.

The rise in demand will be propelled by the nonmanufacturing sectors, which will account for 53.3 percent of the total demand in 2010, up from 41.8 percent in 1988.

By contrast, the share of the manufacturing sectors will fall from 58.2 percent to 46.7 percent during the period, the report said. Several factors make the long-term energy outlook increasingly murky, the report said. They include tightening the supply-demand balance in the world crude oil market, persistent public antagonism toward nuclear power generation, and growing concerns about the global environment. These factors combined could create a severe shortfall in Japan's electricity supply, the report said.

In order to counter such a situation, the report said, the government should aggressively continue the development of electric utilities based on a wider range of sources while promoting energy conservation movements nationally. The report, however, acknowledged that there are limits to how much more dependence can be placed on nuclear power, given its controversial safety record.

But the report, nevertheless, called for a sizable rise in the share of nuclear power, saying it is superior to other energy sources, particularly in safety, cost, and environmental feasibility. Therefore, the report said, the government should immediately devise action programs to establish a high-level radioactive waste disposal system.

Government Admits Difficulty of Nuclear Goal

*OW1606044690 Tokyo KYODO in English 0852 GMT
15 Jun 90*

[Text] Tokyo, June 15 KYODO—Achieving the government-set long-term goal for increasing nuclear power generation will be a tall order, a government report admitted Friday. The report pointed to growing public apprehension about the safety of nuclear plants, which was intensified by the 1986 accident at the Chernobyl Nuclear Power Station in the Soviet Ukraine as the major obstacle to any sharp increase in nuclear power generation in Japan.

The 38-page report was prepared by the Nuclear Subcommittee of the Advisory Committee for Energy at the request of the Ministry of International Trade and Industry. It follows two other recent reports by the ministry which called for a substantial rise in the share of nuclear power in the nation's energy supply.

The Supply and Demand Subcommittee under the same advisory forum has said Japan should aim to double the share of nuclear power in its total energy supply to 16.7 percent by 2010, and the Electricity Utility Industry Council has proposed that as far as electricity is concerned, nuclear power should account for 43 percent of the total electricity supply by that date, up from 26.6 percent in 1988. These figures already represent sizable downward revisions from former government goals, but the nuclear subcommittee report said they will still be quite difficult to attain.

Meeting the targets will require the construction of some 40 nuclear plants in the next 20 years in addition to 38 now operating.

The growing opposition of residents to construction of plants in their neighborhoods is reflected in the delay between proposals to construct plants and the start of actual operations. The process now takes an average 26.8 years, compared with 7.9 years in the 1970's, the report said. And of the 12 plants now under construction, only two are being built at new sites, with the remainder being additions to existing plants, it pointed out.

Especially troubling to proponents of nuclear power is the negative shift in the attitude of the public, who were formerly relatively indifferent to nuclear issues, it said. In order to allay public misgivings toward nuclear power, the report stressed the importance of stepped-up public relations activities.

Equally indispensable are efforts to make it easier for a local community to accept a government proposal to construct a nuclear plant. It emphasized that the expectations of local communities concerning nuclear trade-offs have changed. They now have greater hopes for more long-term favorable effects on local industries and living standards of inviting a plant rather than just short-term compensation, the report said.

Also vital for boosting the public acceptability of nuclear power is the development of reliable ways of disposing of nuclear waste. In this respect, the report urged the government to draw up an action program for a high-level disposal system for radioactive waste without delay.

NORTH KOREA

USSR Suspends Nuclear Reactor Sales to North

SK1506125590 Seoul Television Service in Korean
1200 GMT 15 Jun 90

[Text] [Announcer Yang Hwi-pu] Chong Kun-mo, minister of science and technology, says that the Soviet Union has suspended the sale of four nuclear reactors to North Korea.

Minister Chong is now visiting the United States after attending an executive meeting of the International Atomic Energy Agency. In an interview with reporters in the United States, Minister Chong said that the Soviet Union and Eastern European countries are as worried as the United States and China about North Korea's refusal to sign the nuclear safeguards agreement, and he added that China is also urging North Korea to stop nuclear development.

North 'Likely' To Sign Nuclear Safeguards Pact

SK1606071090 Seoul YONHAP in English 0648 GMT
16 Jun 90

[Text] Washington, June 15 (OANA-YONHAP)—North Korea is likely to sign the nuclear safeguards accord of the International Atomic Energy Agency (IAEA) by August, South Korean Science and Technology Minister Chong Kun-mo said Friday.

Chong said he knew the Soviet Union, worried by Pyongyang's refusal to enter the safeguards pact, had backed out of a deal to sell four nuclear reactors to the North.

Visiting Washington after participating in an IAEA meeting in Vienna, Chong said IAEA member countries, including the Soviet Union and East European nations, would adopt a resolution calling for Pyongyang to join the safeguard accords if it hadn't done so before a meeting on nuclear non-proliferation in Vienna scheduled for August.

"I heard that North Korea will join the accord by that time," Chong said.

North Intends To Withdraw From Nuclear Treaty

SK1606040990 Seoul Domestic Service in Korean
0300 GMT 16 Jun 90

[By correspondent Pak Un-won from Vienna]

[Text] North Korea revealed that it will withdraw from the Treaty on the Non-Proliferation of Nuclear Weapons [NPT] in case the United States does not ensure that it will not carry out a nuclear attack.

Facing a protest lodged by some 20 member nations including the United States against its failure to conclude the treaty on measures for nuclear safety, the North Korean side showed such intention.

Since North Korea took a hardline position to withdraw from the NPT under a political excuse, people are paying attention to how the discord between North Korea and the International Atomic Energy Agency over the treaty on measures for nuclear safety will come to a conclusion.

Paper Says Pyongyang Close to Nuclear Capability

HK1806010690 Hong Kong SOUTH CHINA SUNDAY
MORNING POST in English 17 Jun 90 p 7

[By James Adams in London]

[Text] The hardline communist regime ruling North Korea is on the verge of developing nuclear weapons, according to Soviet officials. They are alarmed it could lead to increased tension on the already volatile peninsula. The Soviets have given the information to the U.S., in another example of greater co-operation between the superpowers. They claim that the regime of Mr. Kim Il-song acquired considerable expertise and materials from the former regimes ruling East Germany and Romania.

They also revealed that both countries assisted South Africa in its nuclear programme, finally convincing the U.S. that Pretoria has the bomb.

Soviet officials said East Germany and Romania had sold enriched uranium and sensitive nuclear materials to North Korea and South Africa, forcing the U.S. to revise its assessment of North Korea's nuclear capability.

"The Soviet assessment was that North Korea would have nuclear weapons within six months," said one senior Pentagon source. "We think they may be a little premature, although not by much."

Until this information was handed over, the U.S. believed the North Koreans were at least five years away from possessing nuclear weapons, despite the China's [as published] assistance.

Much of the sophisticated technology may originally have come from Western companies, using the two Eastern bloc nations as conduits to North Korea and South Africa.

Despite the revelations, both South Africa and North Korea have indicated they intend to sign the nuclear Non-Proliferation Treaty soon, which will mean rigorous examinations of their nuclear programmes to ensure materials are not being diverted for weapons.

But experts concede that the inspections may be too late because nuclear weapons could already have been stored. "If a country has already got the material to make bombs or has already made them, is it going to declare that to the inspectors?" asked Mr. Leonard Spector, a nuclear proliferation expert. "The real problem is the stocks these countries already have, not what they might produce in the future."

The sharing of nuclear intelligence between the superpowers is a sign of the degree of Soviet concern about nuclear proliferation. The Soviets have told officials in Washington that they are particularly worried about North Korea's nuclear programme because they have little influence over Mr. Kim's government.

North Korea is one of the few remaining reactionary Marxist states.

North Nuclear Weapon Capability To Be Verified

*SK1806034590 Seoul Domestic Service in Korean
0300 GMT 18 Jun 90*

[Text] The government has sent emergency instructions to the ROK Embassy in the United States and the ROK Consular Department in the Soviet Union to verify the truth of the foreign press report that the Soviet Union informed the United States that North Korea will be capable of producing nuclear weapons within six months.

A high-ranking government official today said that the government has so far not been informed by the United States or the Soviet Union of the possibility of North Korea producing nuclear weapons, adding that he, however, cannot disclose the ROK Government's own evaluation of North Korea's nuclear weapon production capabilities.

The official stressed that in view of the stage reached by North Korea in the development of nuclear weapons, it is urgently necessary to create an international atmosphere for making North Korea sign the international nuclear safety agreement.

Reports on North's Nuclear Ability 'Speculation'

*SK1906100790 Seoul YONHAP in English 0905 GMT
19 Jun 90*

[Text] Seoul, June 19 (OANA-YONHAP)—South Korean Science and Technology Minister Chong Kun-mo on Monday responded cautiously to reports that North Korea will develop an offensive nuclear capability by the end of the year.

Returning from Vienna, where he attended an International Atomic Energy Agency (IAEA) Board of Governors meeting, Chong told reporters that it remained simple speculation whether North Korea had acquired the technological know-how indispensable for developing nuclear weapons.

"North Korea has a 30,000 kw-class experimental nuclear reactor at Yongbyon, 90 kilometers north of Pyongyang, and we cannot deny that it could make plutonium out of nuclear fuel used in the reactor, but it has not been confirmed if North Korea is equipped with processing facilities to extract high purity plutonium," he said.

Assuming that North Korea is now ready to develop nuclear weapons, he said, it is highly likely that they would use plutonium rather than concentrated uranium as raw material for the weapons, agreeing with foreign news reports. The 51-year-old Chong is an atomic expert and chairman of the IAEA General Assembly.

"The development of nuclear weapons is a matter of politics rather than of technology, and primitive nuclear weapons can be made out of 1940's technology, though state-of-the-art nukes are a different story," he said. "University students have the technological know-how to make a nuclear bomb."

North Korea has invited worldwide suspicion by refusing to sign the IAEA's nuclear safeguards agreement for 36 months after elapse of the 18-month signing period that began when it joined the Nuclear Non-Proliferation Treaty in December 1985.

"During the IAEA Board of Governors meeting, representatives from 20 nations, including the United States, the Soviet Union, and East Germany, out of the 35 board nations, strongly urged North Korea to sign the agreement," Chong said. Signing would require Pyongyang to open its nuclear facilities to international scrutiny, and so far North Korea has repeatedly said it would sign the agreement only if all U.S. troops and all nuclear arms were first removed from the South.

"As North Korea informed the IAEA Board of Governors meeting, if Pyongyang sends negotiators to Vienna around July 10 and signs the accord, a provisional Board of Governors meeting will be held immediately to deal with the matter," Chong said. "However, if the North keeps withholding its signature without reaching the right conclusion, my sampling of international public opinion (in Vienna) tells me that North Korea will come under open fire from lots of nations."

"The possibility of North Korea's signing the accord is 50-50, and we have to wait and see what North Korea comes up with in two months. The bright side lies in North Korea's willingness to send negotiators and in its camouflaged but apparent bid not to be isolated."

Paper Cited on North Nuclear Arms Development

*SK1706103390 Seoul Domestic Service in Korean
0900 GMT 17 Jun 90*

[Report by correspondent Han Chu-kyong From Hong Kong]

[Text] The SOUTH CHINA MORNING POST, an English-language paper published in Hong Kong, has

reported that there is a high possibility that North Korea will have the capability to possess nuclear weapons within six months and that the United States and the Soviet Union are worried about the possible effect that such a nuclear development plan by North Korea will have on the Korean peninsula.

Quoting a Soviet diplomat stationed in London, the newspaper reported that the Kim Il-song regime of North Korea had received a considerable amount of nuclear fuel and high technology necessary for developing nuclear weapons from the defunct East German and Romanian regimes prior to the reforms for democratization in these countries last year. The paper also reported that, besides North Korea, the Republic of South Africa, had also received nuclear development support from East Germany and Romania through Western arms dealers.

The paper also reported that the Soviet Union had shared this information with the United States and that prior to receiving the information, the United States had estimated that it would take more than five years for North Korea to possess nuclear weapons.

ROK Paper Discusses DPRK Nuclear Weapons Development

*SK2106030090 Seoul CHUNGANG ILBO in Korean
18 Jun 90 p 3*

[Article by reporter An Song-kyu]

[Text] A Western press report that says North Korea will be capable of producing nuclear weapons in six months is making the world nervous. If this report is true, another deadly tension factor will be added to the situation on the Korean peninsula, which is still not witnessing any lessening of military tension, and it will significantly disturb the overall military balance in Northeast Asia.

In particular, the six-month period noted in the report completely overturns the previous Western appraisal of North Korea's nuclear capability.

So far, North Korea's nuclear capability has been expressed this way: "The present technological level of North Korea has not reached the stage where it can produce weapons; however, since it may try to produce weapons, we ought to place it under international surveillance."

Wolfowitz, U.S. under secretary of defense, speaking last April on the potential development of nuclear weapons by North Korea, said, "North Korea has quite a way to go before it can produce nuclear weapons."

The United States had faith in the Soviet Union's thorough control over nuclear proliferation and North Korea's lack of its own nuclear technology. Therefore,

the Bush-Gorbachev talks and the subsequent U.S.-Soviet foreign ministers' talks were focused on the potential future development of nuclear weapons by North Korea.

Moreover, there recently have been hints that North Korea might accept inspections by the International Atomic Energy Agency (IAEA), reducing worries about North Korea's nuclear capability to a certain degree.

However, the recent report is all the more shocking because it overturned the current premises about North Korea's nuclear capability. This is because the source of North Korea's nuclear technology is East Germany and Romania, which are outside Soviet control. It is also because North Korea will be producing nuclear weapons in six months rather than five or six years, and because North Korea's acceptance of international nuclear inspection is not suitably workable.

Also, the fact that this information came from the Soviet Union is fairly convincing. Some consider it a mystery as to why the Soviet Union, which has so far thoroughly exercised its thorough control over the nuclear status of East Europe and the Third World with its enormous intelligence capabilities and which has not worried about North Korea's nuclear capability to date, should have disclosed the information so suddenly, as if it had not known about it at all.

Because the United States has never disclosed any direct evidence about North Korea's nuclear status, the Soviet official's remarks remain unsupported by concrete proof.

Therefore, it is too early to assess the truthfulness of the Soviet official's information. Some speculate that he may have made these remarks to exert international pressure on North Korea because, despite North Korea's hint of accepting IAEA inspections, there still are unsettled problems between the Soviet Union and North Korea, or to exert pressure on North Korea to extensively transform itself.

SOUTH KOREA

U.S. Denies Soviets Supplied Facts on DPRK

*SK1906014890 Seoul YONHAP in English 0136 GMT
19 Jun 90*

[Text] Washington, June 18 (OANA-YONHAP)—The U.S. State Department has denied being told by the Soviet Union that North Korea will have nuclear weapons within six months. Recent reports were completely false and the United States was not informed by Soviet officials as reported, a State Department spokesman said Monday.

The United States was concerned because North Korea has not joined the nuclear safeguards agreement of the International Atomic Energy Agency, but anticipates

along with the Soviet Union that North Korea will sign the agreement as soon as possible, he said, speaking on condition of anonymity.

Under the Nuclear Non-Proliferation Treaty, which North Korea joined in December 1985, the safeguards agreement is to be signed within 18 months of joining the treaty, but there is no provision to enforce the regulation.

Meanwhile, sources at the Korean Embassy expressed doubt that North Korea could develop nuclear devices within six months and denied Seoul-based reports that the Korean Government had ordered the embassy to confirm the reports, which originated in London with the latest issue of the SUNDAY TIMES.

Seoul Bids To Join IAEA Conventions

SK1406024290 Seoul YONHAP in English 0114 GMT
14 Jun 90

[Text] Seoul, June 14 (YONHAP)—South Korea has applied to join two accords of the International Atomic Energy Agency (IAEA) on prevention of nuclear accidents, a Foreign Ministry spokesman said Thursday.

The convention on early notification of a nuclear accident, and the convention on assistance in the case of a nuclear accident or radiological emergency take effect July 9, he said.

Under the accords, after a nuclear accident, the government should immediately notify nations within the danger area and can call for help from neighboring nations and the IAEA, he said.

In Korea, nuclear energy is used to produce about 51 percent of electric power.

North's Missile Base Construction Denounced

SK1906020890 Seoul SEOUL SINMUN in Korean
16 Jun 90 p 2

[Editorial: "North Korea's Construction of Nuclear Base in DMZ"]

[Text] In testimony before the U.S. Congress as soon as he returned from a visit to Seoul in February, U.S. Defense Secretary Cheney warned North Korea's nuclear development plan is threatening East Asian security. At that time, an international atmosphere of reconciliation and disarmament was maturing in East Europe, prompted by the trend of democratic reform in the socialist countries, and all states in the East and West were declaring an end to the postwar cold war system. Accordingly, North Korea's nuclear development, which was verified internationally last year, appeared to be reckless maneuvers to prepare for war, running counter to this international trend.

It has been learned North Korea this time is constructing two new guided missile launching sites in the Demilitarized Zone [DMZ] on the Korean peninsula. This new guided missile, which North Korea developed by

improving on the Soviet-made Scud-B missile, has a range estimated at 500 to 600 kilometers. Thus, the entire area of South Korea is within its range. Furthermore, it was learned this missile is capable of launching nuclear and chemical warheads. This indeed is a serious situation for security on the Korean peninsula.

North Korea's construction of missile launching bases was confirmed by a U.S. intelligence satellite early this month, and our vigilance has been heightened. The nuclear development and nuclear-delivery capability achieved by North Korea, as well as deployment of such means in actual war, not only run counter to the new international atmosphere of detente and to disarmament policy, but also will be a practical factor that basically destroys the military balance on the Korean peninsula and heightens tension in East Asia.

For a long time, North Korea has deployed 70 percent of its entire troop strength in the forward areas along the armistice line. In particular, all offensive fighting power, including surface-to-air missiles, tractor-drawn artillery [kyonim po], tanks, armored cars and self-propelled guns, which are easily mobilized between the rear area and front line in time of war and in case of a surprise attack, have been deployed and concealed in the forward areas along the armistice line.

It is true that, prompted by the recent international trend, discussions on arms control and arms reduction are being briskly held. In addition, our side's effort and measures for dialogue include concrete disarmament negotiation plans. The North Korean authorities also have recently put forward several proposals on the issue of disarmament between North and South Korea. Judging from what was reported, however, North Korea's spoken attitude proved to be different from the truth. Since what North Korea says and does are different, its attitude and intentions are different, and moreover, such difference is related to the military questions concerning relaxation of tension and consolidation of peace on the Korean peninsula, we have no choice but to work out various measures to cope with such double-dealing tactics by North Korea.

North Korea refused to sign the international nuclear safety agreement despite inducement and pressure by the international community, including the United States and the Soviet Union. If North Korea's refusal is related to its construction of nuclear bases in the DMZ on the armistice line, this should not be overlooked. We think the U.S.-North Korea contact, which is reported to have been held in Beijing and other places, even after the ROK-USSR summit talks, also should deal with North Korea signing the nuclear safety agreement.

We now should clearly show our position toward North Korea's nuclear development and construction of new missile bases. While North Korea constantly calls for denuclearization of the Korean peninsula and withdrawal of U.S. troops, we hope it will not make an unwise choice.

Vigilance on North's Nuclear Weapons Discussed

SK2006125090 Seoul TONG-A ILBO in Korean
18 Jun 90 p 2

[Editorial: "The Rumor That North Korea Is Going To Have Nuclear Weapons—Its Double-Dealing Strategy Needs Our Vigilance"]

[Text] A report from London and Hong Kong on 17 June that North Korea is going to have nuclear weapons within six months greatly shocks and concerns us. If this report turns out to be true, it will inevitably pose a great threat not only to the Korean peninsula, where an atmosphere of detente and disarmament appears to be in the offing, but also to the political situation in East Asia as a whole, not to mention that it could have harmful effects on both. Moreover, if this is true, we should review our arms control policy as a matter of course, while it could also have an immediate effect on Japan's military buildup.

What we must be particularly vigilant against at this juncture is North Korea's double-dealing strategy. Although North Korea has recently presented to the South a conciliatory face, it has been quickening the development of formidable nuclear weapons behind a veil of proposals for disarmament and peace. According to an analysis of photographs taken by French and U.S. satellites, North Korea is believed to be capable of producing at least one nuclear weapon a year with the plutonium extracted from the spent uranium fuel at the research nuclear reactor in Yongbyon which has been in operation since 1984. Military experts believe that if North Korea has received technical assistance for producing nuclear weapons from East Germany and Romania, then it will be able to produce nuclear weapons within a short period of time. This theory is backed by the fact that North Korea has already deployed in areas close to the frontline improved, Soviet-made Scud-B missiles, which are thought to be capable of carrying nuclear warheads.

These new ballistic missiles have all of South Korea within their range. Furthermore, the problem is that North Korea last 31 May proposed disarmament talks with the South in a very active peace offensive, calling for turning the Korean peninsula into a nuclear-free zone, for the signing of a declaration of nonaggression between the North and South, and for reducing armed forces below the level of 100,000 in both the North and South. We should remember our past experience and should be very careful and vigilant in responding to such proposals. Shortly before carrying out its southward invasion during the 25 June Korean war, North Korea was perfectly prepared to attack and then surprised the South with a peace offensive by proposing to hold North-South talks before carrying out the attack. It also proposed to hold talks with the South shortly before attempting to strike Chongwadae in 1968.

Each and every time, we have fallen victim to such double-dealing strategies. Experts around the world say

that given the progress made in North Korea's nuclear development, it may be too late to apply brakes to its nuclear development, even if North Korea signs the nuclear safeguards accord. Why is North Korea developing its nuclear weapons in such a hurry?

First, North Korea seems to have realized that given the economic capabilities of the North and South, the South will have military strength far superior to its own in a few years and that the best and simplest way of coping with it will be the development of nuclear weapons of its own.

Second, North Korea seems to think that once it has its nuclear weapons, it could force the United States to come to negotiations over the issue of withdrawing U.S. troops from South Korea, its ultimate goal, as well as the removal of nuclear weapons that the United States has neither admitted nor denied having in the South.

Third, North Korea may seek to convince its reliable followers in the South that its strength is rising, not diminishing, and encourage them to continue to support North Korea. North Korea has not yet abandoned its ultimate goal of "liberating South Korea by force." All this shows that North Korea is bent on acquiring nuclear weapons in order to have the upper hand in negotiations with the South over the withdrawal of U.S. troops from South Korea and in disarmament talks as well.

What we must do at this juncture is, first, fully mobilize our diplomatic effort in order to drive home the point as was discussed in the first Korean-Soviet summit talks, that North Korea's acquisition of nuclear weapons will jeopardize peace on the Korean peninsula and in Northeast Asia and then to persuade the countries throughout the world to keep North Korea from getting nuclear weapons. Second, we must, without fail, make the topic of North Korea's nuclear weapons a precondition in our still-emerging arms control proposal to North Korea and stress the point that if North Korea pushes through the production of nuclear weapons, there is no point in continuing arms control negotiations or disarmament talks. The Korean peninsula is a place very sensitive and weak regarding nuclear weapons. We are very much concerned about this and, therefore, should be vigilant against North Korea's double-dealing strategy.

THAILAND

Atomic Energy Official on Nuclear Plans

51004301 Bangkok THE NATION in English
29 May 90 p 2

[Article by Kenneth Ywin—first paragraph is THE NATION introduction]

[Text] Will Thailand go nuclear to generate electricity? Some say this is the best alternative. Kenneth Ywin talks to Suchat Mongkolphantha, secretary general of the Office of Atomic Energy for Peace.

The use of nuclear power for generating electricity seems to be the most appropriate alternative for Thailand around the year 2000.

This is what the representative from the Electricity Generating Authority of Thailand (EGAT) commented during the 3d Nuclear Science and Technology Conference held at the Office of Atomic Energy for Peace (OAEP) recently, according to Suchat Mongkolphantha, OAEP secretary general.

"Nuclear power is the most appropriate alternative as compared with other sources damaging forests and wild life as well as polluting the environment, in addition to causing the greenhouse effect to the atmosphere," is what the representative told the conference, said Suchat in an exclusive interview with THE NATION TECHNOLOGY.

Prime Minister Chatichai Choonhavan said last February that the country could face serious power shortage in the future, "and could be in 2026 or even sooner."

The premier said that a nuclear power station is now considered vital to fuel national development.

Electricity consumption in Bangkok alone for the month of April has risen to more than 3,000 megawatts from about 2,700 in previous months.

EGAT power plants can produce 7,282.8 megawatts which is more than the current peak consumption of 6,681.2 megawatts recorded on April 26.

The peak, if the weather gets hotter, could rise to 6,887 megawatts.

Demand for electricity has been rising steadily with an increase of 15 per cent last year over 1988. This is in sharp contrast to the average of about seven per cent in earlier years.

With the economic boom and the opening of new factories, housing estates, condominiums, the consumption could outstrip supply.

"The responsibility of OAEP is to supply safety information and developed manpower to work in the field of nuclear regulatory when the government set out the nuclear power programme. We have established a small group of engineers and scientists working as a regulatory ad-hoc for nuclear power facilities for the nuclear power project at Ao Phai, Sri Racha since 1972.

"Due to the suspension of this project, we have had to rearrange our regulatory function to render service as a regulatory group for other nuclear facilities such as research reactor and food irradiation facilities," said Suchat.

However, if the nuclear power programme has to be implemented again, OAEP, according to its responsibility for plant safety purpose, would have to develop a full scale of manpower for the regulatory body staffing at

the earliest stages of the activities and carry out its functions of licensing, safety assessment, inspection and enforcement at every step of the programme: nuclear power programme planning, site evaluation, project implementation, plant construction, commissioning, operation and maintenance and decommissioning at the end of the life-time of the plant.

One of the possible sites mooted was Sri Racha District in Chon Buri Province in 1969.

Suchat said that the work on site selection has been done since 1982 under the technical cooperation agreement between Cesen (Centro Studi Energia Genova, Italy) and OAEP, EGAT and the Office of National Environment Board (NEB). "From our country's geographic [perspective], the potential site could be some appropriate locations close to the sea," said Suchat.

The type of commercialized nuclear power reactors for generating electricity and that could be of interest to EGAT, according to Suchat, are as follows:

- Pressurized Light Water Moderated and Cooled Reactors;
- Boiling Light Water Moderated and Cooled Reactors;
- Pressurized Heavy Water Moderated and Cooled Reactors (Canadian type).

"However, the reactor type and the necessary-related facilities of the plant depend solely on the justification of the utility [EGAT]. The OAEP takes the responsibility for the regulatory aspects for ensuring the safe operation of the whole nuclear programme," said Suchat.

The OAEP has been established since 1961 and its main activities involve three areas: Performance of regulatory roles pursuant to the Atomic Energy for Peace Act; coordination of activities and foreign relations in the execution of nuclear-related programmes in Thailand; promotion and support of research and development in nuclear technology for peaceful uses as well as operation of a national research reactor centre.

The OAEP staff of all levels—administrators, scientists and engineers—are designated to participate in meetings, seminars and conferences according to their specific responsibilities corresponding to the entitled meetings which are regularly organized all year round by the International Atomic Energy Agency (IAEA) or other organizations concerned. About 55 OAEP staff members attended meetings last year.

The latest conference which the OAEP secretary general attended was the First International Conference for Nuclear Cooperation in Asia held in Tokyo last March. High-level policy decision-makers from eight countries of the Asia and Pacific region took part in the conference.

"Some of the resolutions reached in this 'conference'," said Suchat, "was that the countries in the Asia and

Pacific region will create more long-term cooperation among themselves in all aspects relevant to peaceful uses of nuclear technology, especially nuclear power and its related programmes.

"We also agreed on holding this kind of conference every year. The venue and agenda of the meeting will be considered accordingly."

When TECHNOLOGY asked "How does the OAEP justify its existence as Thailand still has no nuclear reactors?" the secretary general answered: "The peaceful application of nuclear energy for country development covers many aspects, not only nuclear power programmes but also nuclear medicine, industry, agriculture, and so forth.

"We would like to clarify also that the OAEP does have a nuclear reactor which is the swimming pool type research, not the power one. It has been in operation for more than 27 years.

"The first core, a 1 MW Research Reactor manufactured by the Curtiss-Wright Company, went critical for the first time on October 27, 1962. The second core, a 2 MW Triga Mark III reactor by the General Atomic Company was put into operation on November 7, 1977.

"This reactor is utilized for radioisotope production in addition to research and development activities by nuclear-based techniques. The radioisotopes produced,

such as I-131 and Tc-99m, and chiefly used for medical diagnosis and therapy are much cheaper than the imported ones.

"This helps save a lot of money and gives the poor patients an opportunity to get cured by the best method of treatment," said Suchat, an MS graduate in radiological science from the University of Washington, Seattle.

The OAEP, which employs about 350 staff members, also extends its service for R&D activities as the national nuclear centre to various institutions and universities; they include the Department of Agriculture, the Department of Fisheries, Chulalongkorn and Kasetsart universities.

"So, not only our staff members but also the scientists from these technical organizations benefit from the Thai research reactor," said Suchat.

"We try to utilize nuclear techniques in all aspects for the development of the country. We have, at present, succeeded in many fields such as rice mutation, sterilization of medical products, non-destructive testing [NDT] and food irradiation to name a few."

The OAEP secretary general strongly feels that the general public need to be exposed to nuclear reactor information in order for them to accept it as an alternative source of power in the future: "Yes, the public still has strong negative views on nuclear energy and has been very embedded in nuclear hazards such as the Atomic Bomb, Three Miles Island accident and the Chernobyl accident."

BRAZIL**Technology, Equipment Contraband in Third World***90WP0089B Rio de Janeiro MANCHETE in Portuguese 12 May 90 pp 42-43*

[Article by Joel Macedo]

[Text] The top meetings between the leaders of the superpowers have brought tranquillity to the world. As a result of the thaw in the Cold War between the United States and the Soviet Union, the many byproducts of which included the collapse of the Berlin Wall and a wholesome resumption of relations between East and West, mankind has entered a less tense period: the probability of waking up in the morning to find the planet in flames because of the detonation of one of the tens of thousands of nuclear warheads possessed by Bush or Gorbachev in their arsenals has diminished noticeably. But a new threat is appearing on the horizon: the thousands of atomic bombs in the hands of the Soviets and the Americans may not be as worrisome as before, but what can we say about only one of those nuclear warheads in the hands of someone like al-Qadhafi, for example, or someone as headstrong as Saddam Husayn?

Almost immediately after ensuring ourselves of a good night's sleep following the consolidation of detente between the superpowers, we are being awakened by a sudden nightmare: the nuclear threat has not disappeared. It is alive and well, and it comes from the Third World!

The seizure at London's Heathrow Airport of 40 U.S.-made nuclear detonators being smuggled to Iraq—known as krytrons, they are essential for causing any atomic explosion—has restored to the world the feeling that it is balancing on a sharp two-edged sword. Iraq is one of the many countries in the so-called Third World—along with Libya, Iran, India, Pakistan, North Korea, Argentina, and Brazil itself—where nuclear research has reached a very advanced stage and is at the point of being able to build a bomb. Seizure of the capacitors, which were said to have been bought secretly by Iraqi agents in the United States, inevitably places that Middle Eastern country on the list of potentially dangerous nations on the way to converting their nuclear self-sufficiency into a military ante presenting a high risk to world security. Baghdad's version of events, by emphasizing that the seized devices were intended for a university project concerned with laser rays, not the detonation of warheads, signals that many of those Third World "sorcerer's apprentices" prefer to keep the extent of their murderous investments a secret.

Nothing Prevents al-Qadhafi From Buying Bomb

Despite the sarcasm of the Natural Resources Defense Council [NRDC], the U.S. agency for strategic affairs, which said that Iraq was years away from achieving its dream of building an atomic bomb—the NRDC's Stan

Norris told TIME: "They are smuggling detonators without having anything to detonate"—it is undeniable that Israel's neighbors possess ballistic missiles capable of launching warheads, whether nuclear or not. The performance of Iraqi missiles on land in the war with Iran and the launching in December of a 48-metric-ton rocket capable of carrying satellites into space are proof that while Saddam Husayn's country may not yet have the "poisoned arrow," it definitely does have the bow for shooting it.

The development of military technology in the field of nuclear weapons has led to a longer list of those possessing the so-called absolute weapon, which was once restricted to the elite arsenals of five big powers: the United States, the Soviet Union, Great Britain, France, and the PRC. Today it is estimated that besides the five pioneers in the atomic club, Israel has from 200 to 300 nuclear weapons, South Africa has from 15 to 20, India has a little over 20, and Pakistan has four atomic bombs. As far as Brazil and Argentina are concerned, mastery of the technology necessary for building a warhead is within the reach of both, and only factors of a political nature may be able to delay the building of the bomb.

In this significant picture, there is nothing, for example, to prevent Libya's top leader, Colonel al-Qadhafi, from presenting one of those new possessors of the bomb—particularly Pakistan—with a dollar offer it cannot refuse as a means of getting just one of those devices in his own arsenal. And the most alarming possibility is that a terrorist organization might manage to buy a nuclear weapon itself.

Brazilian SS-300 Has Assured Customers

But it is in the field of chemical weapons and ballistic missiles that the arsenals of the Third World seem to be proliferating as fast as a plague of locusts. Ballistic missiles are capable of delivering multiple nuclear warheads and chemical weapons to targets at distances ranging from 300 to 2,000 km. Until just a few years ago, ballistic missile programs in the Third World were regarded as caricatures of the competition between the superpowers, but the situation has changed. In a review of each country's potentialities, the International Peace Research Institute, whose headquarters are in Stockholm, points out that 12 countries outside NATO and the Warsaw Pact are developing bigger and better missiles, with the most impressive programs being those in Brazil, Israel, and India—countries in a position to design such systems on their own.

The big Brazilian attraction in the international market for ballistic missiles of the latest generation is the SS-300, a powerful "toy" developed by Avibras [Avibras Aerospace Industry, Inc.] International, a private firm headquartered in Jacarei, Sao Paulo. Produced for use by the Army and for export, the SS-300, which is already coveted by the firm's traditional customers—the Saudis, Libyans, and Iraqis—is derived from the Soviet Scud-B tactical missile, but has a Brazilian inertial guidance

system that performs admirably. Capable of hitting a target 300 km away, the missile delivers a warhead containing 550 explosive charges and weighing one metric ton.

But Avibras' shaky financial situation (the firm filed for a composition to avoid bankruptcy in January in order to stretch out repayment of its debt, which is estimated at between \$200 million and \$250 million) will probably delay the entry into service and consequent marketing of the SS-300. That delay is creating room for a debate on Brazilian arms export controls. Regulation of that sector has been so lax that international security organizations are beginning to put pressure on Brazilian authorities to surround arms exports with requirements that will at least prevent their retransfer in what are called triangular transactions. The purpose is to prevent nuclear weapons manufactured here from winding up in the hands of mobsters or adventurers after being acquired from us by some other government. But Minister of the Navy Admiral Mario Cesar Flores maintains that exports of Brazilian war materiel "have not been and are not likely to fuel any conflict, and they have not been and are not capable of upsetting any regional equilibriums."

The Second- and Third-World countries currently possessing ballistic missiles are these: Argentina, Brazil, South Africa, Egypt, Libya, Israel, Syria, Iraq, Iran, Saudi Arabia, Yemen, Afghanistan, India, Taiwan, and North Korea. Significantly, in the Book of Revelations, which is the last book in the Bible and which contains prophecies still to be fulfilled, we find descriptions in chapter 9 of scourges which many eschatologists relate to this proliferation (and future detonation) of nuclear missiles. According to the prophecy, they will travel through the air during the seven years of the Beast, commonly known as the Antichrist, and literally transform our world into an apocalypse [the Book of Revelations is called "Apocalypse" in Portuguese] during the so-called Great Tribulation that is predicted in Christianity's prophetic texts.

The proliferation of chemical weapons, which, like nuclear weapons, depend on missiles for delivery to their targets, is even more alarming. Cuba, Nicaragua, Peru, Chile, Angola, Ethiopia, Libya, Egypt, Israel, Syria, Iran, Iraq, Afghanistan, Pakistan, India, China, Thailand, Burma, Vietnam, Taiwan, South Korea, and North Korea are some of the countries whose back yards are piled high with those devastating devices. President Saddam Husayn declared recently that Baghdad has "a binary chemical weapon capable of devastating half of Israel." What he was referring to was a chemical agent composed of two chemicals that remain harmless as long as they are kept separate. As used in Husayn's speech, "binary" means that when combined, those two chemicals become lethal.

As if its intrinsic malignancy were not enough, the chemical arsenal scattered around the planet necessarily constitutes an avid consumer market for ballistic missiles, which few countries produce on a commercial

scale. In the controversial market for nuclear devices, the seizure in London of the U.S. detonators being smuggled to Iraq draws attention to a black market 10 times more dangerous to mankind than the drug trade. From drug cartels, we are moving on to the stage of living with underworld cartels trafficking in nuclear devices—a sophisticated trade in the technology of death.

Successes in Parallel Program Surveyed

90WP0089A Rio de Janeiro MANCHETE
in Portuguese 12 May 90 pp 36-41

[Article by Helio Contreiras—first two paragraphs are MANCHETE introduction]

[Text] International organizations concerned with nuclear energy in Europe and the United States now know that Brazil is enriching uranium for its first nuclear-powered submarine, nuclear power plants, or even (if someday it is bold enough) the bomb. Until now, the press has not had access to the superguarded laboratory where all this is happening: the Aramar Experimental Center in Ipero, Sao Paulo. Last week MANCHETE penetrated the secrecy, and here now, for the first time in the world press, are photographs of the facilities where Brazil is working on its atom (the machines shown here [photograph not included] are autoclaves, which keep the uranium hexafluoride at the proper temperature). For the alarmed and the alarmists, we have some reassuring information: Brazil does not want the bomb.

The facilities at the plant in Ipero are controlled from this room [photograph not included], from where an operator observes everything through computer terminals and operates mechanisms by pushing buttons. Technicians say there is complete safety, and to prove it, they eat vegetables grown near the plant. Radiation levels are measured constantly by an ecological control section.

The Autonomous Nuclear Program has now provided Brazil with a passport enabling it to join the most exclusive elite group on the planet: the atomic club. At the uranium enrichment plant located a little over 100 km from Sao Paulo, the Aramar Industrial Center is now in a position to supply fuel for Brazil's first nuclear-powered submarine and an electric power plant. If it wanted to, it could think about an atomic bomb, but it knows that that would be absolute madness: "The atomic bomb should be regarded realistically as what it is: an instrument of destruction that ensures not victories but defeat for everyone," says General Deoclecio Lima de Siqueira, former Air Force chief of staff.

As early as the 1950s, Admiral Alvaro Alberto (for whom the plant in Ipero is named) was advocating nuclear research. He was preaching in the wilderness, and many people saw him as a visionary. Until, in 1980, the Navy and the National Nuclear Energy Commission began developing an autonomous program parallel to the one

being carried out by the government under the agreement signed with the FRG in 1975 during the Geisel administration.

While the official program (covered by the agreement with the FRG) kept leading to fiascos like Angra I (the turnkey technological package), the autonomous program was achieving spectacular results. Working with scientists from Sao Paulo University's Institute for Nuclear and Energy Research (IPEN), the autonomous program mastered the technology for uranium enrichment, which until then had been the exclusive property of powers such as the United States, the Soviet Union, China, Japan, Great Britain, France, and Holland.

At the Ipero plant, the uranium enriching equipment is located in the Alvaro Alberto unit, which is one of the most restricted areas and one surrounded by the greatest safety procedures. The only thing is that the men inside that unit do not wear special masks or clothing like that worn by astronauts. One official, engineer Pedrosa, explained: "There are no radiation problems here. Uranium hexafluoride is a gas, but if a leak occurred, it would immediately solidify, with no threat to human life."

The technology developed by the Autonomous Nuclear Program is ultracentrifugation, a method of separating the radioisotopes of uranium-238, which exists to an extent of 0.7 percent in natural uranium [as published]. Uranium-235 is the fissionable uranium, and it is what makes possible the nuclear chain reaction that converts nuclear energy into thermal energy. Operating like a cream separator, the centrifuge separates the isotopes of uranium-238 from uranium-235. Enrichment consists of increasing the uranium-235 content. In the case of the Angra I nuclear power plant, for example, uranium is enriched from two to four percent. Enrichment for the IPEN's reactor reaches 20 percent, and that is more than what is needed for the reactor in a nuclear-powered submarine.

In the control room at the Alvaro Alberto Unit, engineer Pedrosa opened a glass partition and pointed to the enrichment equipment. "There it is. You can photograph it, but do not show the part involving state secrets because we need to safeguard our technology." MANCHETE's photographer set up his tripod, placed his camera on it, and aimed in the direction of the centrifuge. In a few moments he would be recording one of the latest discoveries by Brazilian researchers. Engineer Pedrosa looked through the lens of the Nikon and said: "You focused just right." In an atmosphere of total curiosity, MANCHETE's reporters opened a door and watched preparations being made for another enrichment unit. The date on which it will begin operations has not yet been decided.

When construction of the Ipero nuclear complex began, there were demonstrations against it. But the safety measures that were adopted have reassured the inhabitants. Especially since one of the main objectives of the

autonomous program is construction of the atomic submarine. And a submarine reactor has to be much safer than one in a nuclear power plant. No one in the Navy wants to play hero by going on board a submarine whose reactor is not completely safe. Apparently the components of the first reactor are already being manufactured by Brazilian firms in Sao Paulo. The components will be submerged in a tank that will be built in Ipero. Only after that will construction of the reactor for the first Brazilian atomic submarine begin. Because of the current budget restrictions, the submarine cannot be completed until the final years of this 20th century.

Technicians Work Without Masks

One of the concerns of those involved in the program is atomic waste, chiefly plutonium, which is produced within the reactor itself wherever enriched uranium is used. The reason is that the atomic bomb can be built using plutonium-239. To do so, however, it would be necessary to have a plutonium-producing reactor, and such reactors exist only in the United States, the Soviet Union, France, Great Britain, and China. Plutonium would be extracted by reprocessing the irradiated fuel, and doing that would require construction of a plant especially for that purpose. The bomb that exploded over Hiroshima in August 1945 had about four tons. The weight of the plutonium was relatively low, but there was a steel structure designed to cause an unimaginable chain reaction.

The chairman of the Navy's Coordinating Office for Special Projects (Copesp), Admiral Othon Luiz Pinheiro da Silva, absolutely rejects the idea that Brazil might venture into the insanity of building the bomb. He prefers to emphasize the benefits that nuclear research has brought to Brazilian industry. "Very soon we will have set up the Ipero High Technology Center Foundation. The technological benefits for industry will be even greater than those obtained so far. We are going to open up the Aramar Center's facilities to firms in the region."

Adm. Othon has been watching over the day-to-day work of the autonomous program for 10 years. "Investments have exceeded \$300 million, including payroll. But it needs to be explained that most of that—over 90 percent—was in the form of national currency." In a very proud tone, he pointed out: "We are now one of the few countries in the world to enrich uranium and process it to the point of making it a source of heat for the generation of energy. This makes it a very important fuel not only strategically but also economically, scientifically, and technologically. Very few other countries have this ability."

The enrichment technology developed in Brazil is the most economical of all known technologies, he said. China, for example, is abandoning the gaseous diffusion method (adopted by Argentina and also the method used to enrich uranium for Angra I) in favor of ultracentrifugation.

Bomb Would Be Gate to Apocalypse

Japan, whose industrial management methods are considered the most advanced in the world, has also chosen ultracentrifugation. In any case, thanks to the technology it has now developed, Brazil will be able next year to stop importing radioisotopes for medical use in the preventive treatment of disease. Brazil has 1,700 hospitals using radioisotopes in the prevention of heart problems, thyroiditis, gastritis, and other diseases.

Safety measures at Ipero are not limited to the Alvaro Alberto Unit. They also extend to the other facilities at the Aramar Experimental Center, examples being the training building, where technicians are taught industrial safety; the radioecology laboratory, which is concerned with environmental protection studies; the administration building; the building where centrifuge components are manufactured; and the testing station where the condition of steam and electrical equipment is checked. Navy officers say they are ready to welcome any authorities from Ipero or the State of Sao Paulo who want to inspect the facilities. They confirm that work will soon get under way on a project of local and national interest—the Ipero High Technology Center—that will benefit the town.

Despite everything, the question remains: what about the bomb? Technicians and military reply with a laugh that that would be contrary to Brazil's strategic interests. They all agree with Gen. Deoclecio Lima de Siqueira, who is currently head of the Air Force Historical and Cultural Institute. He says: "All countries, including Brazil, must forego plans to build an atomic bomb. In Brazil's case, the defense option calls for developing high-tech but conventional projects involving lasers and electronic warfare, for example. But not the atomic bomb. And not chemical warfare." After all, the A-bomb could open the way to apocalypse.

CNEN Shuts Down Monazite Plant Temporarily

90WP0088A Sao Paulo O ESTADO DE SAO PAULO
in Portuguese 18 May 90 p 10

[Text] Rio—The physicist Anselmo Paschoa, executive director of the National Commission for Nuclear Energy, yesterday ordered the closure for three days of the Santo Amaro Monazite Sands Processing Plant (USAM) to enable the plant, which is operated by NUCLEMON [NUCLEBRAS Monazite and Associated Elements, Limited], to meet the safety standards ordered by the commission, the organization responsible for supervision of nuclear matters.

Paschoa reached this decision based on the studies that have been carried out since 1984 concerning the indices for radiation existing at USAM, as disclosed by AGENCIA ESTADO last January. The measurements made inside the plant, which processes thorium from monazitic sands, recorded levels above those established by the CNEN [National Commission for Nuclear Energy].

In a press release, the commission reported that the problem affects only the USAM employees without impacting the environment. The CNEN ordered that to enable the plant to meet the minimum safety standards, NUCLEMON should "certify the qualifications of radiological protection supervisors," a measure that Anselmo Paschoa says would in practice mean testing the competency of those responsible for this task.

In addition, USAM will need to install special cloakrooms to control access by employees to the interior of the plant. These will enable the NUCLEMON employees who work at the plant to change clothes and bathe. In a third directive, the CNEN ordered that every work shift at the Santo Amaro plant have "at least one radiological protection technician" on duty.

The plant will also have to build dumps that will be used exclusively for "contaminated waste" in the production sections. In the three days prescribed by the CNEN, USAM must begin implementation of a program to prevent respiratory problems among its employees.

In its press release, the CNEN also states that the plant is being required to present a plan to control liquid effluents, as well as a plan for monitoring its personnel by means of examinations of samples of feces. The CNEN wants the area around the "dumpsite for Cake No 2"—a byproduct of the radioactive waste produced by USAM—to be isolated.

Because of its concern over the transport of materials inside the plant, the commission ordered changes in the methods currently employed in the plant's laundry "so as to ensure decontamination of the soiled clothing." The use of contact lenses in the production area is henceforth prohibited—a measure which Paschoa explained will prevent the radioactive residues from contaminating the lenses and thereby adversely affecting the human organism. "If all these requirements are not met," the CNEN director insisted, "the plant will remain closed."

ELETRONBRAS Urges Construction of 4 More Plants

90WP0088B Sao Paulo O ESTADO DE SAO PAULO
in Portuguese 22 May 90 22 May 90 p 10

[Article by Rubens Santos: "ELETRONBRAS Asks For 4 More Nuclear Plants"]

[Text] Brasilia—Jose Luiz Alqueres, director of planning and engineering for ELETRONBRAS [Brazilian Electric Power Company, Inc.], yesterday in Brasilia advocated the construction of four new nuclear plants in Brazil. Each plant would have a capacity of 1,300 megawatts, the equivalent of 40 percent of electric power consumption in the state of Rio de Janeiro. These projects, which would be carried out between 2001 and 2010, were presented by ELETRONBRAS at a meeting of the task force created by President Fernando Collor to establish a nuclear policy for the nation.

ELETROBRAS regards construction of the four nuclear plants, and continuation of the Angra II and Angra III projects, as necessary to maintain a balance in the generation of power for the Southeast, Midwest, and Northeast. The task force is attempting to transform the Brazilian nuclear problem into a program of integrated and unified goals that will be transmitted to President Collor on 1 June.

Within the framework of this series of proposals, a decision has already been taken to continue the autonomous program coordinated by the National Commission for Nuclear Energy (CNEN), the Navy, and the Institute for Nuclear and Energy Research (IPEN). This program, which as of April had already spent more than \$340 million, is manifesting progress in mastering nuclear fuel technology and in developing nuclear reactors, in which \$189.3 million has already been invested.

There is a consensus among the members of the task force that the autonomous program, in which \$30 million is being invested this year, should continue its research in the area of enrichment of uranium by ultracentrifugation. The construction of Angra II, however, is

still generating controversy, as is also the continuation of the program for enriching uranium by centrifugal jet.

Also among the most controversial issues that will be decided this week are the agreements made between the Brazilian Government and 15 other countries in the area of nuclear energy. On this point there are differences of opinion, for some sectors of the task force created by Collor advocate continuation of the cooperation agreements with all of these countries, while others want a revision of the treaty with the Federal Republic of Germany. On at least one point the government and the members of the task force are in agreement: Brazil will not sign the nuclear arms nonproliferation treaty.

The task force also plans to take before the president the question of moving the executive offices of the CNEN from Rio to Brasilia. The commission has today more than 600 employees and an annual budget of \$160 million. The process of moving to Brasilia is already under way: while a team of technicians seeks office space in Brasilia to house the commission's executive offices, another team in Rio is deciding the future of the civil servants involved.

INDIA

Expert Visits Vietnam To Study Uranium Resources

51500122 Madras THE HINDU in English 16 Apr 90
p 7

[Excerpts] Hanoi, April 15—India will establish a national committee this year to celebrate the centenary of the hero of the Vietnamese revolution and former President, Ho Chi Minh, the External Affairs Minister, Mr. I. K. Gujral, said here on Saturday. He was talking to press persons after the fourth session of the Indo-Vietnamese joint commission on economic, technical and scientific cooperation. [passage omitted]

Peaceful Use of Atomic Energy: India and Vietnam have agreed to expand cooperation in peaceful use of atomic energy. An Indian delegation for the Atomic Energy department, which recently visited Vietnam for a study of its uranium resources, has submitted its report to the Indian Government. This was disclosed in the final minutes of the joint commission meeting. India also informed the Vietnamese delegation that the pilot plant for monazite processing, which is a gift from the Atomic Energy department is in the final stage of completion.—PTI, UNI

Indian Rare Earths Plans New Plant for Tamil Nadu

51500121 New Delhi PATRIOT in English 16 Apr 90
p 10

[Text] Tuticorin, April 15 (PTI)—The public sector Indian Rare Earths Limited (IRE) is to establish a mineral separation plant at Kudiraimozhi in Tamilnadu's Chidambaranar district at a cost of Rs 40 crore.

The IRE, under the administrative control of the Department of Atomic Energy, is engaged in mining and production of beach sand minerals like ilmenite, rutile, monazite, zircon and sillimanite. Its mining units are located in Kerala, Tamilnadu and Orissa.

In view of the increasing demand for beach sand minerals in the country and abroad, the IRE is considering setting up of projects for exploiting new deposits for production of minerals.

Investigations carried out by the atomic mineral division of the Department of Atomic Energy during the past decade had proved the occurrence of extensive mineral bearing "tari-dune" deposits in different parts of Tirunelveli-Kattamomman and Chidambaranar districts in Tamilnadu.

Of the several deposits located, the one in Kudiraimozhi, about 50 kms from here, had the most extensive single dune deposit with the highest content of heavy minerals. The deposits extend over an area of about 52 sq km. The

deposit is known as Teri (red) because of its reddish brown color due to heavy ferrogenous coating on sand grains.

The deposit is estimated to contain about 240 million tonnes of raw and with an average of about 8.2 per cent heavy minerals. At an annual production level of about one lakh tonnes of ilmenite and association minerals, the deposit is estimated to last for several decades.

For the execution of the project the IRE had signed a Memorandum of Understanding for forming a joint venture with the Tamilnadu Industrial Development Corporation (TIDCO), a Tamilnadu Government undertaking.

Exploitation of the deposit will be taken up in a phased manner and as the mineral deposit lies in the reserved forest area an integrated afforestation scheme in the exploited area has also been envisaged.

Besides, a well structured environmental management programme is being formulated so that quality of the environment is maintained.

The water requirement for the project will be met by tapping underground water through bore wells. Trials by the State groundwater department to assess the availability of water at various locations in the mining area is in progress. Steps are also being taken to get necessary clearance for the project from various departments of both the center and the State Governments.

Mr R. K. Garg, Chairman and Managing Director of the IRE, inaugurated the project office on April four last at a function here.

Mr M. Kangasabapathy, Collector of Chidambaranar district, who participated in the function, said about 1,200 acres of land had been acquired at Palayakayal, near here and it would be handed over to the Atomic Energy Department for the establishment of a titanium project.

Minister Menon Comments on Safety of Reactors

BK2905110890 Delhi General Overseas Service
in English 1000 GMT 29 May 90

[Text] Indian heavy water reactors are among the safest in the world in terms of their design and character. Giving this information in the upper house of parliament today, the minister of state for science and technology, Professor M.G.K. Menon, said India is not building Chernobyl-type reactors. He said the safety features of the pressurized heavy water reactors built in the country are quite different from those of the Chernobyl system.

IRAQ

Brazilian Engineers Aid in Manufacture of Missile**Piranha-Type Missile Technology**

90WP0090U Sao Paulo VEJA in Portuguese 16 May 90 p 53

[Text] This past Sunday the 13th, three Brazilian engineers had reserved seats on a flight to Baghdad, Iraq. Their purpose: to round out the task force working in a secret project involving construction of a missile that will equip the Iraqi Air Force with technology from the Brazilian Government. In Baghdad, a group of scientists is trying to produce a version of the Piranha missile, which was originally supposed to be carried on the Brazilian Air Force's AMX fighter planes but never got past the prototype stage. The first 23 engineers—all of whom formerly worked for the Orbita rocket firm in Sao Paulo or the CTA [Aerospace Technology Center]—were hired by the HOP [expansion unknown], a firm owned by one of the country's best known researchers, Air Force General Hugo Piva, former director of the CTA, and arrived in Baghdad last November. There they earn about \$6,500 per month, live with their families in a guarded apartment hotel in the center of town, and work at a military installation on the outskirts.

In Brazil, the Ministry of Aeronautics stopped financing and then stopped buying Piranha missiles for good at the end of 1988, when the equipment was ready to enter the assembly line. In March of last year, Gen. Piva, who by then was in the reserves, approached then Minister of Aeronautics Octavio Moreira Lima with a plan for exporting the Piranha team to Iraq. The Baghdad government was prepared to pay the Brazilian Government \$10 million for the computer programs (software) developed by the CTA along with all the designs and plans for the missile. According to Piva, Moreira Lima liked the idea and gave him the "green light" to proceed with the plan provided that it was done through a private contract and did not involve the government. Moreira Lima denies it. "That is an invention by Piva," says the former minister. "The government knew about the negotiations, but never participated in them." The fact is that so far, the Iraqi Government has been unable to close the deal for purchasing the software, and the team is now trying to do the whole thing over in Baghdad.

Atomic bomb—"We could not let a team of scientists of that caliber become scattered with nothing to do," says Gen. Piva. "In two or three years, they will return to Brazil to build an even more advanced missile." The design of the Piranha, which has a range of five km and carries 12 kg of explosives, was copied after that of the best selling missile in the world, the U.S. Sidewinder. The Iraqi version of the Piranha is supposed to be able to pursue enemy fighter aircraft by homing in on the heat from their turbines and also to deceive devices designed to detect missiles of its type. The government spent over

\$50 million to design the Piranha and would have spent another \$70 million to mount it on the AMX fighters. In Moreira Lima's opinion, it would be cheaper to buy dozens of Sidewinders or French Exocets at \$100,000 each.

The Piranha might give Iraq, which is in permanent conflict with its Middle Eastern neighbors, its chance to produce a reasonably modern missile. President Saddam Husayn's government, which is having difficulty buying sophisticated weapons from the West and was recently caught trying to smuggle nuclear detonators through the London airport, has been using pirate firms to hire hundreds of foreign scientists to set up its own arms industry. And it makes no secret of the fact that its ultimate goal is to build an atomic bomb. Husayn went on Iraqi TV last week to announce that he had finally obtained his detonator secretly by smuggling it from the United States and that using it as a sample, his technicians had made a few more like it.

It does no good to have atomic bombs unless one also has missiles capable of carrying them long distances—and the Piranha is no good for that purpose. It happens that the Brazilian team now in Baghdad is essentially the same one that developed the Brazilian Air Force's project for a "Big Piranha" capable of delivering a nuclear warhead to a distance of 1,000 km, a project that resulted in Piva's coming to be nicknamed the "Brazilian Von Braun"—a reference to the scientist who designed rockets for Hitler and then became the father of the U.S. space program. But that project never got off the drawing board. It is suspected that another Brazilian team in Baghdad recently improved a Soviet medium-range missile for Husayn—and that the new version is large and powerful enough to carry a nuclear warhead. The Brazilian Ministry of Aeronautics has no restrictions that would keep Brazilians from engaging in technological research abroad, but if it discovers that the missile being produced for Iraq is indeed the Piranha, it will consider prosecution on a charge of stealing technology.

Investigation Under Way

90WP0090V Rio de Janeiro O GLOBO in Portuguese 16 May 90 p 3

[Text] Sao Jose dos Campos, Sao Paulo—The minister of aeronautics, Air Force General Socrates Monteiro, took personal charge yesterday of all information and all measures relating to the investigation of the sale of services to Iraq by a team of engineers specializing in the design and development of missiles. The minister telephoned all the member of the ministry's High Command and told them that from that point on, only he would be authorized to make statements on the subject.

In all the FAB [Brazilian Air Force] circles contacted yesterday, the prevailing opinion was that the sale of those services would result in the transfer of sensitive technology and of information classified as secret and that the deal was situated in a "gray zone." That interpretation indicates the difficulty of proving any possible

leaks to Iraq of designs and software for the Piranha air-to-air missile. It also indicates the difficulty of interpreting the matter from the legal standpoint, although the implications with respect to the security of military intelligence are obvious.

Some military men said that Gen. Hugo Piva, who owns the consulting firm that sold services to Iraq, might have been resentful of the fact that the FAB abandoned the missile.

Additional Suspected Involvement

90WP0090W Rio de Janeiro O GLOBO in Portuguese
17 May 90 p 7

[Text] Sao Paulo—Major General Hugo de Oliveira Piva of the Air Force Reserve and his HOP [expansion unknown] consulting firm are not alone in being suspected of transferring technology for the manufacture of missiles to the arms industry in Iraq. For the past year, employees of Embraer [Brazilian Aeronautics Company] and Orbita Aerospace Systems have been providing the Baghdad government with services in the areas of aerodynamics, structural and flight testing, trajectory control, on-board electronics, and propellants.

A group of experts from Embraer went to Baghdad a week ago to continue development of a missile guided by sensors that detect infrared radiation—waves of heat emitted by aircraft turbines. That missile will be similar to the Piranha developed by the Aerospace Technology Center. They are also there to improve the performance of the Soviet Scud missiles used by Iraq. Those engineers joined others from Orbita who had arrived in the country in mid-February with Gen. Piva at their head.

According to information from military sources, the Brazilian group working for the Iraqi military industry numbers far more than the 26 engineers hired by Gen. Piva. Executives at the firms connected with those deals could give no explanation of the matter. At Orbita, Deputy Chairman Vito Di Grassi had left word that he would not talk to the press. The head of Embraer and Orbita, Ozilio Carlos da Silva, spent the day in meetings and did not give out any information.

PAKISTAN

Nuclear Program Examined by Soviet Paper

90UM0607Z Moscow KRASNAYA ZVEZDA (First Edition) in Russian 23 May 90 p 3

[Article by Col S. Bakov: "Nuclear Ambitions"]

[Text] Recently Pakistan has stepped up its work of creating nuclear weapons, for which the country's leaders are allotting substantial funds, and doing so even to the detriment of other military programs. It should be remembered that Islamabad's program for the development of the so-called Islamic atomic bomb was approved already by the government of Zulfikar Ali Bhutto. Under

that government the foundations of the corresponding scientific and technological base were laid. After the military, headed by Gen Zia-ul-Haq, seized power in the country in 1977, implementation of the nuclear military program in Pakistan was stepped up. Efforts in this direction are also continuing under the current government, headed by Benizar Bhutto.

From the beginning of the 1970s a program for developing its own nuclear weapons has been underway in Pakistan, code named Project 706. The Pakistanian nuclear scientist Abdul Kadir Khan is its leader. Within the framework of this program, the technology for obtaining weapons-grade uranium is being developed, and the industrial base for stockpiling it in the required quantities is being created. Undoubtedly, it is in connection with the use of atomic energy primarily for military purposes that the Pakistanis decline to place the majority of their atomic scientific research and industrial base facilities under monitoring by the International Atomic Energy Agency, and to this day have not signed the nuclear nonproliferation treaty.

The nuclear center at Kakhut, 30 km east of Rawal Pindi, is an especially secret and protected facility, which is directly related to Pakistan's military nuclear program. In this center is a factory for the separation of uranium isotopes. The 10,000 gas centrifuges in the center operate around the clock on Islamabad's nuclear military program. According to evaluations by Western specialists, the Pakistanis were already able to assemble several nuclear weapons from the weapons grade uranium developed in Kakhut.

Judging by everything, the Pakistanis are not satisfied with the rate of development of weapons grade uranium, and to "correct" the situation have begun to assemble more productive equipment in Kakhut, as well as the construction of yet another factory for separation of uranium in the Golra area, 10 km west of Islamabad. Plans are to obtain a substantial amount of enriched uranium of high purity in the more modern gas centrifuges of this factory than those in Kakhut, which will make it possible to put the production of nuclear weapons "on stream."

Implementation of the nuclear program is supported by the presence in the country of uranium ore reserves assessed at 20,000 tons. Extraction is going on at uranium mines in the area of Dera-Gazi-Khan. Located here is a uranium enrichment factory created with assistance from the FRG, with an annual capacity of 200 tons of uranium concentrate. According to calculations, weapons purity uranium for 16-24 nuclear weapons with an average yield of 20 kilotons can be obtained from this quantity of uranium raw materials during its subsequent processing.

It should be emphasized that Pakistan is also conducting an active search for sources for acquiring uranium raw

materials abroad. A so-called Organization for the Production of Special Works has been created to purchase materials, raw materials and equipment needed by Pakistan's atomic industry.

Thus, over the last several years Pakistan has been able, using its scientific and technical base, to stockpile fissionable substances suitable for use in nuclear warhead devices. Whereas back five to seven years ago such assessments were always made with some qualifications, today this is no longer of any doubt even to the most careful specialists. In the figurative expression S. Solarz, U. S. Congressman, and chairman of the subcommittee on Asian and Pacific Ocean affairs of the House Committee on Foreign Affairs, the statements by the Pakistani governments that their country is not engaged in the development of an atomic bomb, are "not worth the paper they are written on."

Pakistan's completion of development of its own tactical and operational-tactical missiles, with operating ranges of 80 and 300 km respectively, introduced substantial clarity into the assessment of the state of her nuclear capability. Range tests of these missiles, which were named Khatf-1 and Khatf-2 [phonetic], were conducted in early 1989. It is believed that these missiles can be used as nuclear weapons carriers. Pakistan can also use F-16 fighter-bombers obtained from the U. S. as such carriers. Reports have long been received about the Pakistanis refitting aircraft of this type as carriers of such weapons.

The example of Pakistan shows how dangerous the shortsighted, conniving policy of countries possessing nuclear missile technology, with respect to those states that are trying in any way to obtain nuclear weapons, may be to strategic stability and the cause of peace at the present stage. The lack of principles and thoughtlessness

of all the recent American administrations, and those of several of its Western allies, are of the greatest regret in this plane.

It is known that the Symington-Glenn amendment to the law on military assistance to foreign states, approved by the U. S. Congress in 1976, forbids rendering this assistance to countries that are engaged in the development of their own nuclear weapons. Pakistan was on the list of these states. The U. S. CIA presented proof to the American leadership on this score. However, day to day interests of the Carter, Reagan and Bush administrations associated with events surrounding Afghanistan, judging by everything, forced them knowingly to close their eyes to obvious instances of Islamabad's defiant nonobservance of the conditions that it was to observe in order to obtain the tremendous assistance that the U. S. has been giving it in recent years. The heads of the American administrations, knowing that the Pakistanis will never grant the United States authority to monitor their nuclear facilities, limited themselves to the "word of honor" of Pakistan's leaders that Islamabad was supposedly not working on its own military nuclear program.

Prime Minister Benazir Bhutto, speaking on 29 March of this year at the annual session of Pakistan's atomic energy council, expressed satisfaction about the course of implementation of the country's nuclear program. Not long before this, Munir Ahmad Khan, chairman of the government commission on atomic energy, was awarded one of Pakistan's highest orders.

All this indicates that Pakistan's plans in the nuclear field are being successfully implemented. What these plans are, to this day still remain largely a guess, but there can be no doubt that Pakistan's military nuclear program, with all of the ensuing dangerous consequences, is being successfully implemented.

AUSTRIA

Fire at Salzburg Office Linked to Iraqi Project

AU1206193890 Vienna KURIER in German 13 May 90
p 17

[Text] Incidents of arson have occurred on almost an everyday basis since Easter in the city of Salzburg. After a harmless fire in an office, now even the state police has opened an investigation: A terrorist attack cannot be excluded. The company is allegedly involved in Iraq's rearmament plans.

For Salzburg's professional fire brigade it was not an uncommon mission: On 27 April at 0600 in the morning the office of a trading company on Alpenstrasse burned down. Nobody was injured. The fire was rapidly extinguished. First the police thought that the fire had been caused by a computer that was incorrectly installed. According to the company the damages amounted to 5 to 10 million schillings. A few hours later the state police began its investigations. According to the state police, the Delta Consult Studien GesmbH company was a supplier of electronic construction plans for missiles. According to information from the BBC and the U.S. NBC, the enterprise, via its parent company in Switzerland, is involved in the armament plans of Iraqi President Saddam Husayn.

The fact that in a telephone call the Iranian "fighters of Islamic Revolutionary Brigades" claimed that they had carried out the attack fits into the picture. Speaking to the Austria Press Agency, the caller accused this organization of having carried out the attack and announced that another fire would soon hit a subsidiary of the Salzburg-based company. A second act of terrorism has so far not occurred while the police have stepped up the protection of the office block.

The state police picked up a clue. Salzburg's security director Anton Stenitzer confirmed for KURIER that thieves had entered the house of the manager of the company which was the target of the attack, at Bad Aussee a few days before the fire: "This indicates that the perpetrators were professionals." It is suspected that thus the arsonists "got hold" of the company keys.

The head of the Salzburg branch of the state police, Karl Koenig, said that it cannot be excluded that the motive for the attack was an "act of personal revenge" by the "mysterious" (Koenig) circle of foreign companies that are linked to Delta Consult. According to French newspaper reports of March 1990, the parent company "Consen" was previously the target of a bombing attack. In 1988 the company moved from Monaco to Zug in Switzerland, after the car of Consen head Ekkehardt Schrotz was attacked.

In 1989, BBC television disclosed the involvement of Delta Consult in the construction of the controversial Argentine Condor missile. According to information from France, the "Condor-2" project was subsequently

continued in Iraq under the management of Consen with the objective of building a missile with a range of 1,000 km. The newspaper LE CANARD ENCHAINE reported that 150 electronic specialists and computer specialists of the armament industry were dispatched to Iraq.

CANADA

Epp: Canada Favors Helping Romania Complete Candu Complex

51200020 Toronto THE GLOBE AND MAIL
in English 15 May 90 p A8

[Article by Hugh Winsor]

[Text] Ottawa—In principle, the Canadian Government is in favor of helping Romania complete its five-reactor Candu nuclear-power complex, Energy Minister Jake Epp said yesterday. But any additional help will depend on satisfactory financing and technology agreements being worked out.

Mr. Epp was responding to reports that Romania will be seeking an additional \$300-million from Canada and extensive technological support to salvage what was intended to be former dictator Nicolae Ceausescu's showcase project to thrust the poor East bloc country into the nuclear age.

But after Mr. Ceausescu was executed in December, it became apparent that much of the work that had been done on the project had been done by unqualified (and forced) labor and did not meet even minimum technical or safety standards. Parts of the reactors will have to be rebuilt with new components, the Romanians say.

"I think it is important to complete the deal, especially if we can find reasonable terms," Mr. Epp told reporters. "Keep in mind, Romania is a country very desperately short of electrical energy and much of their coal technology is literally rooted in the last century."

The Canadian Government will make no decision until after the Romanian general election on 20 May. But Mr. Epp said Canada is part of an international effort to help Central and Eastern Europe to get back on its economic feet and it has taken note of the new Romanian Government's commitment to follow its obligation under the Nuclear Non-Proliferation Treaty.

Mr. Epp said his initial information indicated the work that has been completed is salvageable but would require "a complete reinspection."

In considering any international deal, Ottawa has to consider whether or not it will be paid, Mr. Epp said, but he noted that the previous Romanian Government had kept up the payments called for under the 1981 agreement.

"That doesn't mean we approved of the methods, such as withholding food from the domestic markets, (that) the former government used to obtain the money to pay us," the minister added.

Donald Lawson, president of Atomic Energy of Canada Ltd., the federal Crown corporation involved in the deal, told Canadian press yesterday that the only real limit on AECL's future participation will be how much money the Romanians are willing to spend.

Mr. Lawson confirmed that Romania has asked AECL to send more Canadian engineers (there are now 18 Canadians on the site) to try to put the project back on schedule.

"If more people are provided and they're willing to pay for it, then obviously we'd be prepared to take on the extra business," Mr. Lawson said.

The Candu sale to Romania was the last foreign sale made by AECL.

AECL Seeks Stricter Radiation Emission Controls

51200018 Toronto *THE GLOBE AND MAIL*
in English 4 May 90 p A5

[Text] Ottawa—The Atomic Energy Control Board is seeking stricter controls on radiation emissions from nuclear facilities across Canada. At a meeting yesterday, the federal agency agreed to conduct public consultations on a new policy governing radiation from nuclear plants, uranium refineries and research facilities.

Uranium Plant Allowed To Reopen After Emission Correction

51200022 Toronto *THE GLOBE AND MAIL*
in English 26 May 90 p A7

[Text] Sault Ste. Marie, Ont.—The Cameco uranium refinery at Blind River, which was closed on May 18 after uranium concentrate dust was released at levels exceeding federal guidelines, is expected to resume production by Tuesday.

The Atomic Energy Control Board suspended the licence of the refinery, 140 kilometres east of Sault Ste. Marie, while inspectors from Ottawa were sent to the site to investigate.

The inspectors completed their work on Thursday and the licence was reinstated yesterday.

A spokesman for Cameco said the problem was traced to human error and a design error. Uranium concentrate dust in excess of the federal guidelines was released from a smokestack at the refinery on May 16 and 17. The problem continued for 16 hours before the plant was closed.

Blind River Mayor Robert Gallagher said he and the chief of the Mississauga Indian Band met the federal

inspectors and officials of Cameco on Thursday and were assured that "excessive emission posed an almost negligible risk."

Mr. Gallagher said the officials outlined how the accident occurred and told him that the company was taking steps to ensure that it does not happen again.

More than 75 per cent of the 107 workers at the plant were asked to take vacation time when the plant closed.

Pickering Nuclear Plant Seal Fails Test

51200021 Toronto *THE TORONTO STAR* in English
17 May 90 p A14

[Text] A rubber seal has failed in a key system at the Pickering nuclear plant during a test done once every decade.

But the seal connecting two huge concrete conduits that make up part of the plant's pressure relief duct "failed in a way that we thought it might," said Jack Muir, an Ontario Hydro spokesperson at the plant.

All the seals—some of which are 20 years old—are being replaced in the 9-metre by 9-metre (30-foot by 30-foot) duct, which runs about 800 metres (half a mile) from the reactor buildings to the vacuum building, he said yesterday.

The vacuum building, pressure relief duct and the plant's eight reactor buildings make up the station's containment system. It acts as a safeguard by containing any radioactivity that might be released in an accident.

The eight reactors have been shut down since May 5 for the tests, which were last conducted in 1980, Muir said. The reactors which supply about 20 per cent of the province's electricity, are scheduled to be back in service by June 2, he said.

The shutdown had been planned for more than a year and is not expected to cause any electricity shortages across the province, Muir said.

FINLAND

USSR Nuclear Plant Revives Official Concern

Karelia Unit Near Border

90WP0084A Helsinki *HELSINGIN SANOMAT*
in Finnish 18 Apr 90 p 22

[Article by Sven Wikstrom: "USSR Goes on With Giant Power Plant Project"—first paragraph is HELSINGIN SANOMAT introduction]

[Text] The planning of a 6,000-megawatt nuclear power plant near the Finnish border continues in Soviet Karelia despite a decision to suspend the project.

Studies for the construction of a 6,000-megawatt nuclear power plant 70 km from the border are being continued

in Soviet Karelia despite a decision to suspend them. A repository for nuclear waste only 20 km from the Finnish border is being studied in addition to the big power plant planned for the area near Kuhmo.

According to Galina Pronina, the chief editor of RED FLAG, which appears in Petrozavodsk, the offices of the ministry that decides on nuclear power matters in Moscow and Leningrad have clearly stated that they do not give a rap for the opinions of Soviet Karelia's own decisionmakers and local population.

Larger Than Finland's Plants Combined

Only a few days ago, everyone in Soviet Karelia believed that the decision made by the Supreme Soviet of their own autonomous republic last fall would stand. The presidium of the Supreme Soviet, the autonomous republic's top decisionmaking body, had decided to suspend studies aimed at the construction of the nuclear power plant for the time being.

Major opposition from the local population in part influenced the decision to suspend the project. No one understood why a nuclear plant that would be bigger than all the nuclear plants operating in Finland combined was necessary. Then, too, the population is well enough aware of what happened in Chernobyl.

RED FLAG Reporter Reveals Continuation

Very rare demonstrations were organized against the power project in Karelia, and lists of names were gathered to prevent construction of the power plant.

The continuation of studies aimed at the construction of the nuclear plant was revealed after a reporter from the Petrozavodsk newspaper RED FLAG visited the site. "They have been able to go on with the studies and even step up their efforts without anyone's knowing about it because the district is off the beaten track, and it's very hard to reach," the paper's chief editor, Galina Pronina, explained.

Waste Right up to the Border

The strongest alternative site for the power plant at present is Kuolunkijarvi, a little to the west of the village of Rukajarvi. Kuolunkijarvi is situated near Kuhmo and is one of the upper waters—near Tiiksijarvi—of the Kem' River, which empties into the White Sea.

Studies to find a place to store spent nuclear fuel are a new aspect of the plans for the nuclear power plant. "They are looking for a final repository for the waste at Romuvaara, only about 20 km from the border," chief editor Pronina said.

In the Soviet Union they are not surprised, either, that Finnish nuclear fuel waste may also be stored at Romuvaara. Kuhmo was one candidate for depositing such waste. Romuvaara would eliminate the waste problem for Finnish companies, and a nuclear power plant would ensure electric power imports. Soviet Karelians cannot

see any other reasons for the mammoth power plant. "We don't need anything like that," Pronina said.

Although Moscow and Leningrad have, in their studies for the nuclear power plant, shown the Autonomous Republic of Karelia its place in the scheme of things by riding roughshod over it, the local population does not intend to end its opposition. "We intend to go on [resisting], and I am of the opinion that we can prevent the power plant from being built," chief editor Pronina assured us. "This is not only our affair. One would think that it's also of interest to the Finns."

Soviet Reports Doubted

90WP0084B Helsinki HELSINGIN SANOMAT
in Finnish 20 Apr 90 p 20

[Article: "Nuclear Waste Will Scarcely Be Brought to Border; Industrial Power Company Regards Reports From Soviet Union as Misunderstanding"]

[Text] Lappeenranta (HS)—In Finland no credibility is attached to reports that [Soviet authorities] are looking for a site for a nuclear waste storage facility for the power plant planned for Soviet Karelia that would be near Kuhmo, right on the Finnish border. At the Industrial Power Company (TVO), they view the reports coming from the Soviet Union as a misunderstanding.

In the opinion of Kuhmo residents, Romuvaara, which was named by Soviet sources as the [planned] repository for nuclear waste, is a locality near Kuhmo on the Finnish side of the border that TVO is looking into as an alternative for depositing its own waste.

Anja Alanko, an activist of the Romuvaara movement from Kuhmo, said that she herself had heard suspicions voiced by Soviet opponents of the nuclear power plant that the waste produced by the planned nuclear plant might be brought to a storage facility cut into the rock at Kuhmo.

No Official Reports

The Leningrad-based Lenatomenergoprojekt has not issued any official reports on the magnitude of the studies and plans for the nuclear power plant and for the storage of nuclear waste. Local residents fear that construction of the power plant may begin as early as next summer.

Veijo Ryhanen, who holds a degree in engineering and is in charge of nuclear waste concerns at TVO, said that it is public knowledge that soil studies have been made on the other side of the border for a presumed nuclear power plant. "We have no information to the effect that soil studies have also been made in the same area for the storage of nuclear waste."

Urals Area More Interesting

Ryhanen considers reports of plans for a waste storage facility to be strange if only because the Soviets themselves have stated that they are avoiding areas close [to the border] and that they consider areas on the other side of the Urals to be more interesting from the standpoint of the final storage of nuclear waste.

Ryhanen also denied reports by Kuhmo residents that waste from the 6,000-megawatt nuclear power plant planned for the shores of Kuoiunkijarvi in Soviet Karelia would be brought to the Finnish side of the border for final storage, specifically to Romuvaara near Kuhmo.

"The Soviets have not contacted us at all with regard to depositing spent fuel from the nuclear power plant planned for Soviet Karelia at Romuvaara near Kuhmo," TVO engineer Veijo Ryhanen assured us.

Five Different Areas

All told, TVO is investigating five different areas for the final storage of spent fuel from its nuclear power plants.

In addition to Romuvaara near Kuhmo, soil studies are being conducted at Hyrynsalmi, Sievi, and Pihitipudas, among other areas.

TVO plans to reach an interim decision on its soil studies in 1992. "After that, we'll decide on which areas we'll continue to consider."

The investigation will continue with fewer areas, and, by the year 2000, the company plans to make a decision on the waste repository.

The Romuvaara movement in Kuhmo plans to get the matter to the town council for discussion in May.

Lessening Chernobyl Effects

90WP0084C Helsinki HELSINGIN SANOMAT
in Finnish 26 Apr 90 p 12

[Article: "Grain Is Nearly Decontaminated of Chernobyl Radiation; In Some Places, There Is Still Cause for Restricting the Consumption of Lake Fish"]

[Text] Studies have begun on the health hazards that Chernobyl may have created in Finland. The initial results, primarily on children affected with leukemia, will be obtained in a year's time. According to the Radiation Safety Center, on the basis of preliminary appraisals, there is no evidence that cancer is on the increase anywhere in Finland.

In four years' time, the radioactive fallout from Chernobyl has resulted in a total average dose of about one millisievert in Finns. The average annual dose of radiation one is exposed to from natural sources is about five millisieverts.

The external radiation rate and volume of radioactive cesium ingested with food are still declining. The dose of

radiation Finns are exposed to is smaller than last year's. Long-term radioactive elements, the most important of which from the standpoint of exposure to radiation are cesium 137, with a half-life of 30 years, and cesium 134, with a half-life of 2.1 years, are left over from the fallout.

There was an average of about 2,000 becquerels of cesium 137 in Finns at the end of 1986. The volume of cesium was at its peak in 1987; at present it is about 1,000 becquerels.

In the area where the fallout was the heaviest, the cesium level of inland-water fish still varies considerably, depending upon the size of the lake, the nutrients found in it, and its other properties. More cesium is found in predatory fish. The amounts of radiation found in other kinds of fish began to decline as early as the first year following the accident.

It is still recommended that the use of predatory fish caught in the area of heaviest fallout as a main course in meals be limited to two or three times a week. The consumption of other kinds of fish, game, meat, wild berries, and wild mushrooms need not be restricted in any area because of radiation.

In 1989 the average level of cesium 137 in venison was 150 becquerels per kilogram, 500 in reindeer meat, and 100 in wild berries.

Highest Levels in Lacteous Agaric and Boletus

The highest levels in mushrooms were still found in lacteous agaric and boletus, from 50 to 8,000 becquerels per kilogram. The cesium is almost completely removed from the mushrooms by parboiling or salting.

In 1989 the average level of cesium 137 was under 10 becquerels per liter in milk, 30 becquerels per kilogram in beef, and fewer than 10 becquerels per kilogram in pork. Grains are at present nearly decontaminated. The levels are at the most a few becquerels per kilogram. Potatoes, vegetables, root vegetables, and garden produce are also nearly decontaminated.

By as early as 1987, radiation levels in farm products, with the exception of milk, had dropped to nearly their present levels.

According to the Reuter News Agency, the soil of Norway contains nearly as much radioactivity as it did immediately after the power plant accident. In most of Sweden, on the other hand, the radioactivity level is twice what it normally is, but fully 10 times as much in the worst hit areas.

In some parts of Sweden the consumption of game and fish has to be restricted, and meat may even have to be inspected for radioactivity for decades to come.

Paper Cites Continuing Worry

90WP0084D Helsinki HELSINGIN SANOMAT
in Finnish 29 Apr 90 p 2

[Editorial: "Chernobyl Is Still a Serious Problem"]

[Text] The nuclear reactor at Chernobyl exploded four years ago, but the public is still confused by the reports issued on the volume of radioactive radiation, the destruction, and the risks involved. Some scientists and investigators estimate that the risk engendered by the accident is so slight that, with the exception of a few thyroid tumors in children, it cannot be distinguished from the normal risk of other cancers. The gloomiest judges of the situation believe that the nuclear fallout released during the disaster will kill as many as a million people over the next few decades.

Judging from their credentials, those who issue such both reassuring and alarming statements are competent medical experts and nuclear physicists. These contradictory views are apparently due to the lack of precise information. Ten times more nuclear fallout was released in Chernobyl than by the bomb in Hiroshima at the time, on the effects of which new research reports worthy of consideration are still being written.

However, a thorough and systematic survey of the consequences of the Chernobyl disaster has not yet been launched in the Soviet Union. It is only now, when criticism and protests are increasing, that the country admits that its financial resources are insufficient for a long and exacting effort. According to a newspaper interview with Professor A. Knizhnikov, the Kremlin plans to invite teams of international scientists to study the effects of the radiation on residents and the natural environment.

The invitation is late in coming, but the objects of study have not disappeared. It pays to seize the opportunity for reasons other than purely scientific interest. While the accident forced them to considerably improve the safety and supervision of the nuclear power plants, not all of the world's 434 plants operate as safely. Now is still the time, and it still makes sense to take precautions to prevent the consequences of a new nuclear accident. We are quite right to study the effects of nuclear fallout on, for example, cases of leukemia in children in Finland, too.

Although, thanks to favorable weather conditions, we got off more lightly than our neighbors, and we can now without restrictions use all foods with the exception of some predatory inland-lake fish, the appraisal of the mild effects produced by the radiation must be scientifically confirmed. The latest studies in Japan and Germany indicate that the correlation between the amount of radiation and its injurious effects must be reappraised. After steadily declining for 10 years, the infant death rate rose markedly in the area of West Germany that was subjected to a high level of radioactivity. Death

rate figures dropped more slowly than they used to in areas where there was moderate and mild fallout.

American-Japanese results also confirm the suspicion that there is not an absolutely safe threshold figure for radiation injuries. The risk increases in direct proportion to the exposure time and the magnitude of the dose. Radiation received as a child increases the danger of cancer twofold for one's whole life, as compared with the danger for an adult. The results help in estimating the risk of cancer for the entire population both in general and after an accident.

People should not be alarmed by this new information. We are constantly exposed to a level of background radiation in the natural environment that is often higher than that of the fallout that was carried from Chernobyl to Finland. The results of these studies must be used for the protection of those who have been exposed to radioactive contamination. We must help those who have been exposed to excessive amounts of radiation to avoid exposure to new doses incurred on the job, for example, or from food, and weed out other factors that increase the danger of cancer.

FRANCE

EDF To Acquire U.S. Uranium Company

90WP0087A Paris LIBERATION in French 7 May 90
p 9

[Article by Nathalie Dubois: "EDF Takes Its First Steps Toward Uranium Production"—first paragraph is LIBERATION introduction]

[Text] Electricity of France is a potential buyer for the four uranium mines of the American company Pinnacle West Capital. Its objective: To produce by itself part of the uranium ore of which it is the world's hungriest consumer.

For the first time in its history, Electricity of France is getting ready to embark on a venture to produce uranium. The French group has just been preselected by the American company Pinnacle West Capital following a bid invitation for the sale of the four uranium mines of its Malapai Resources subsidiary. EDF now has six weeks to pore over the balance sheets of the subsidiary and confirm its purchase offer for a still undisclosed sum.

The top objective of the national power producer is to diversify its supply sources for uranium, of which it is far and away the biggest consumer in the world. According to the recent Rouvillois report on the French nuclear subsidiary, EDF spends FR3.5 to Fr4 billion annually on fuel purchases. The 7,000 metric tons of natural uranium the French group buys year in year out come wholly from outside suppliers: 75 percent from COGEMA (General Nuclear Materials Company), 15 percent from the oil company Total, and the remainder from producer countries such as China, Portugal, or the United States. But

with the uranium market in the midst of an oversupply crunch, the number of operators is steadily dwindling. At it watches its supplier base shrink, EDF is concerned that it not find itself a few years down the road faced with a cartel able to lay down the law. Especially as the electric company, despite the slowdown in the French nuclear program, still has 60 plant sections to power in France.

Another reason the French company is trying to get its hand on Malapai Resources's 10,000 tons of uranium reserves is that there are big dollars involved. Unlike some small foreign electric power companies, EDF does not deal on the uranium "spot" market and buys its fuel under medium-long-term contracts only, explains the public company's headquarters. The advantage of these multiyear contracts is that they guarantee the safety of supplies. Their drawback is that they prevent EDF from taking advantage of the current softness in the ore's world prices.

Though the French electric company keeps mum about the content of its contracts, it pays between \$25 and \$30 a pound for its natural fuel, while the "spot" price has currently plunged to a historically low level that no longer even covers extraction costs: \$8.5 a pound. A whopping gap that EDF intends to close partly by buying its American supplier, which "has very low extraction costs and a deposit of over 10,000 tons," stresses Jean Beaufre, assistant head of EDF's fuels division. By the year 2000, the four Malapai Resources mines (two in Texas and two in Wyoming) should supply 10 percent of EDF's needs—at cost (\$15 to \$20 a pound).

In mimicking Japanese or British power companies which already have stakes in uranium mines, EDF is also concerned with resorbing its huge fuel stocks. Today the latter total four years of consumption, or one year more than safety floor set by the Ministry of Industry. Hostage to long-term supply contracts negotiated during a period of nuclear euphoria, EDF is now buying much more uranium than its reactors are using. Besides rollbacks in the sections program, technical strides make it possible to use less fuel and to retreat it. The French power company is hemmed in by its COGEMA contract which does not expire until 1998. Nevertheless, it is endeavoring to cut its highly costly stocks (about Fr53 billion in immobilization). Though the EDF cannot dilute its purchases in France and Black Africa (French diplomatic obligations to Gabon and Nigeria), it already terminated its contracts in Australia last year and plans not to renew its accords with China and Portugal.

By taking over the American Malapai mines, the electric power company is also making sure that all its eggs are not in the COGEMA basket at the end of the decade.

Generator Replacement Program Nears Completion

90WP0097A Paris L'USINE NOUVELLE/
TECHNOLOGIES in French May 90 pp 15-16

[Article by Marc Chabreuil: "Steam Generators: Dampierre-1 Changeout"—first paragraph is L'USINE NOUVELLE/TECHNOLOGIES introduction]

[Text] A French technological first for EDF [Electricity of France] and Framatome: Replacement of three 300-metric-ton steam generators.

At the beginning of next month, operation RGV (Steam Generator Replacement) will be completed. Placed in service just 10 years ago, block number 1 of the Dampierre-en-Burly (900 MW) power plant will then have three brand new steam generators. This is a major French first for EDF and Framatome. Suffering from corrosion under stress and from mechanical wear, this equipment constitutes the weak link in the power plants. Sooner or later, they will all have to be replaced (EDF is planning identical operations at Bugey, Fessenheim, Gravelines... in the next two to three years). Furthermore, the replacement market is significant. For Western Europe alone, it is estimated at 30 new generators between now and the year 2005—a gold mine that Framatome is not willing to abandon to the American companies Westinghouse, Power Cutting Industry, and Bechtel or to the German KWU.

Operation RGV, which will take 13 weeks, has been the object of meticulous preparations: 100,000 hours were devoted to planning, optimization of the reduction of the exposure of personnel to radiation, quality assurance, and implementation costs—not to mention the design and production of 100 metric tons of special tools and automated equipment for working in the radioactive environment.

Dampierre was chosen to test and demonstrate French mastery of the field because block number 1 was to be shut down for a 10-year inspection. And, because "its steam generators presented specific unexplained defects: networks of microcracks not accessible to conventional methods of nondestructive testing," adds Pierre Claisse, of EDF's Nuclear Production Center. Replacement of a steam generator is more than just a "simple" maintenance operation on a 300-metric-ton piece of equipment in a radioactive environment. The primary circuit is first decontaminated by chemical and electrochemical procedures. Then the four piping systems (two for the primary circuit, two for the secondary circuit) are cut off from the plasma by remote control due to the presence of residual radiation. Once the used generator has been removed in one piece, it is necessary to connect the new equipment to the old stainless steel pipes. Following topological measurements with a computerized theodolite, a "mockup" of the new steam generator is inserted. A final adjustment enables programming the numerical control machines which will cut the bevels on the primary lines. Once the new generator is in place (positioning of the

pipe ends with 1-mm accuracy), a triple weld (coated electrode TIG [tungsten-inert gas welding] followed by orbital TIG) is carried out. This is a complex operation—it is necessary to unite new and worn materials—guided and controlled remotely: Video cameras and microphones permit direct monitoring of the welding which will subsequently be inspected radiographically. "To accomplish this, we created a welding school at Chalon-sur-Saone where 40 individuals have been trained in this operation for from one to four months," reports Framatome's Gerard Doremini.

To these purely mechanical difficulties were added the constraints of working in a radioactive environment. "Framatome and EDF developed simulation software, Dosi Ana, enabling daily evaluation of the dosimetry for each operation at each location. The conclusion reached was that the collective dose would not exceed 450 rems," according to Yannick Le Corre, Framatome director of nuclear services. (On 5 April, it was only 100 rems, for an anticipated maximum of 250.)

Called an industrial operation by those in charge of it, "operation RGV, which is expected to require 350,000 work hours on site (two-thirds of it performed by Framatome) and involve more than 500 persons, will cost more than Fr600 million," according to EDF's Marcel Choraine. This is an investment because it has a promising future. The tubes of the new steam generators, made of Inconel 690 with a high chromium content, are less susceptible to corrosion. Furthermore, expert metallurgical analysis of one of the disassembled systems will provide a better understanding of this phenomenon and, ultimately, enable mastery of it—with the goal of a service life of 20 years, instead of the current 15 years. Half that of a nuclear power plant block!

Studies Detail Major Incident Probabilities

90WP0093A Paris *LIBERATION* in French 28 May 90 p 25

[Article by Dominique Leglu: "Beware the Sleeping Reactor"]

[Text] There is a slightly greater than 30 percent probability that any core meltdown would occur while the reactor is shut down. This was one of the risks assessed in two in-depth studies on the likelihood of major accidents at French nuclear power plants....

Our nuclear reactors can be dangerous even when shut down. They are susceptible to the risk of a reactor core meltdown. And in that event, "there is in general no automatic procedure for dealing with an accident situation, and human intervention is necessary." This is one of the crucial points that came out in two probability studies on the safety of France's nuclear power industry (which includes 34 900-megawatt units). The key conclusions of these studies are described below.

We were told by SCSIN [Central Safety Service of Nuclear Installations] director Michel Laverie the

problem is so crucial that SCSIN warned EDF [French Electric Company] recently its personnel would have to take very special precautions when doing any work on idled reactors...

Under the title "What is the probability of a core meltdown in the REP's (pressurized water reactors)?", the two studies were presented before 100 participants at a 16 May meeting in Paris sponsored by the French Nuclear Energy Company (SFEN). The first, called EPS 900, which lasted seven years, from 1983 to 1990, focused on the 900-megawatt reactors, the most common type operating in France. It was carried out by IPSN (Institute for Nuclear Protection and Safety, which falls under the Atomic Energy Commission [AEC]). The second, called EPS 1300, which lasted four years, from 1986 to 1990, focused on France's newer 1,300-megawatt reactors. It was carried out by EDF. The studies were both undertaken with the assistance of Framatome [Franco-American Nuclear Construction Company].

Early this year the very serious issue of reactor core meltdowns at French nuclear power plants resurfaced when Pierre Tanguy, EDF's inspector general for safety, asserted in a report that these serious accidents "have a probability of occurrence on the order of 1 in 100,000 per year per reactor."

A figure which seemed enormous in comparison to those discussed several years ago, when chances of a serious accident were viewed as infinitesimally small...

The studies presented by IPSN and EDF were undertaken to gauge the risk of accidents similar to what happened at Three Mile Island, where core meltdown occurred but the concrete containment structure kept the radioactivity from escaping. Studies on the probability of a Chernobyl-scale catastrophe, the kind the public most fears (explosion, destruction of containment structures, and radioactive products escaping into the environment), have yet to be made.

Meanwhile, the two current studies evaluate "the probability of reactor core meltdown by examining all the scenarios (termed 'accident sequences') which could lead to an accident and calculate their likelihood..." This approach is considered in France as "an important safety analysis tool."

Key Figures

The total probability of a core meltdown is:

- 4.95 in 100,000 per year for each 900-megawatt reactor;
- 1 in 100,000 per year for each 1,300-megawatt reactor.

Overall, the 1,300-megawatt power plants appeared five times as safe as the 900-megawatt units, which seems reasonable inasmuch as the safety lessons learned from

experience with the older 900-megawatt models have been incorporated into the design of the new ones.

That said, a simplified projection over the next 20 years shows that if 50 nuclear power plants are in operation the probability of a core meltdown is greater than one percent—several percent in fact.

Uncertainty of the Figures

"At present, EPS 900 does not take into account internal fires or flooding, or external attacks which can sometimes have significant impact."

Fires can be a major problem inside a power plant. So far the engineers have found it extremely difficult to assign a probability to the outbreak of fire and thus have not factored it into their study. The serious fire that broke out in a Spanish nuclear power plant last year is expected to speed up efforts to assess this risk. The above-cited figures might be changed as a result.

A New Feature: Problems During Shutdowns

"One interesting result is the relatively large portion of the risk (32 percent of the total) associated with idled reactors," says EPS 900.

"More work needs to be done on one of the major conclusions of the study: the large risk factor associated with idle periods," says EPS 1300.

As Laverie told us, the danger of a reactor core meltdown continues "as long as the fuel is still in the core."

This aspect of the studies is likely to attract most attention from experts, because the French "are the only ones to have factored downtime" into their probability studies. On this point the studies are superior to German and American analyses.

The job now is to sensitize operators in the field to these conclusions. According to Laverie, it would be good if all plant operators were able to determine on the spot, in case of a hitch, "how close they are to a major accident." In other words, safety concerns need to be translated into concrete terms for workers at the power plants.

Importance of the Human Factor

"Sequences containing at least one human error account for nearly 70 percent of the total risk," according to EPS 900.

Even in this new age, people are still indispensable in the power plants. People make errors, including mistakes during maintenance, which may trigger accident sequences. But it is also people on whom we must count to make decisions, to set things right, when everything starts to go wrong. When people must react very quickly, for example if there is a breach leading to release of radioactivity while the reactor is idle, they are not very efficient. This is one of the headaches in reactor safety.

Chances for a Chernobyl-type Accident

"The probability of a core meltdown involving bypass of containment structures is 2.4 per million, or five percent of the total risk (of core meltdown)," according to EPS 900.

What "bypass" of containment structures means is radioactivity escaping confinement. For example, radioactive products from the primary cycle could get into the secondary cooling cycle, if a boiler pipe and some steam pipes rupture. In reality, no one knows exactly how much radioactivity would be released from the core on escaping from the broken pipes. Would it be a hundredth, a tenth of what was released at Chernobyl? Or equal to Chernobyl?

Situations That Scare the Engineers

"Several dilution sequences lead to nonnegligible risks. The most significant of these has led to installation (now under way) of a modification to the reactor units," according to EPS 900.

Rapid injections of water may be needed to recool the reactor. The problem is that this water must be suitably diluted in water containing boron to slow down the fission reactions. It was discovered that formation of a pocket of "pure" water could lead to an incidence of unbalanced "reactivity" in the reactor core. In plain words, the question is whether inadequate dilution could lead to a Chernobyl sequence, and whether this kind of situation may not be much more common than one would have dared imagine. An incident of this kind about three weeks ago at the Blayais power plant reportedly gave EDF a bad scare.

These studies should be of particular interest to assembly deputies, who are scheduled next Friday to consider on second reading a bill concerned with "responsibility for nuclear safety." At the very least it is to be hoped the parliamentary Office of Evaluation of Scientific and Technological Options will be aware of it, since on 4 April the assembly staff office called on it "to report to parliament on the monitoring of security and safety conditions at nuclear installations."

IRELAND

Sellafield Alleged To Cause Health Problems in Ireland

BBC Program Cited

51500131 Dublin IRISH INDEPENDENT in English
19 Apr 90 p 1

[Article by Fergus Black: "New Evidence of Sellafield Cancer Link Here"]

[Excerpt] New evidence of an abnormally high level of breast cancer among Dundalk women has been disclosed

by an Irish doctor investigating a link between the disease and the controversial Sellafield nuclear plant.

The revelations follow claims in a BBC television programme last night that the plant was leaking highly-contaminated radioactive particles into the atmosphere long before a huge fire closed down two of the reactors in 1957.

The programme "Inside Story" mentioned that the authorities kept the leaks hidden from the public and that special filters fitted to nuclear stacks failed to prevent radioactive materials escaping into the atmosphere.

Last night, medical researcher Dr. Patricia Sheehan, who has studied the incidence of Downs Syndrome in the Dundalk area, said the programme reinforced her belief that there was a strong link between Sellafield and health problems in this country.

She disclosed that new research she is compiling for the British Medical Journal shows abnormally high levels of breast cancer in the region.

Following research in 1983, she discovered six cases of Downs Syndrome babies born to girls who were at school together at the time of the 1957 fire.

"Now I have research ready to go to the BMJ on a follow-up study of the girls and of another big school in Dundalk. In the absence of a national tumour register, I feel the level of breast cancer there is too high and I still believe low level radioactivity over a prolonged period does have harmful effects," she told the IRISH INDEPENDENT.

Dr. Sheehan said her latest research reinforced her view of a link between Sellafield and her findings.

Dundalk GP Dr. Mary Grehan, who has researched into stillbirths and miscarriages in the Dundalk area, said last night's programme carried no surprises.

"But probably a lot of other things have gone on at Sellafield since then that we know absolutely nothing about and that is the most terrifying thing," she said.

Dr. Grehan said the latest five year study of stillbirths and miscarriages in the area would be completed at the end of this month.

"We have no hard evidence to link what we have found with Sellafield but it is surprising in this particular area that there seems to be a very high rate," she said.

Mr. John Bowler of Greenpeace said the BBC programme strengthened the case for the closure of the nuclear plant. [passage omitted]

Danger From FRG Fuel Contract

51500131 Dublin IRISH INDEPENDENT in English
25 Apr 90 p 6

[Editorial: "Sellafield"]

[Text] The long-running controversy surrounding Britain's nuclear reprocessing plant at Sellafield moved into a higher gear yesterday.

British Nuclear Fuels, the company which operates the plant in Cumbria, announced they had secured a \$225m. contract to recycle 452 tonnes of radioactive fuel from West Germany.

It is not altogether clear what the precise effect this operation will have, but there is a clear danger that it will add to the toxic emissions into the sea and the atmosphere scarcely 50 miles from the east coast of Ireland.

Plainly, this danger is unacceptable—unacceptable to environmental groups in Britain, unacceptable to our Government.

When hearing of this development, Energy Minister Robert Molloy says he is to raise it with our EC partners with a view to setting up an independent international inspection agency to examine the Sellafield complex.

Mr. Molloy is in a strong position to canvass this step. As President of the Council of EC Energy Ministers, he will be able next month to place this country's anxiety before his fellow Ministers and to have the inspectorate in place soon afterwards.

The Irish attitude to nuclear energy is neither alarmist nor Luddite. The potential for nuclear-generated energy is enormous, particularly at a time, soon to arrive, of diminishing fossil fuels.

Nevertheless, safety must be the sine qua non, the condition precedent to industrial progress. That is the nexus of our very strong case for action on Sellafield.

Chernobyl Effect May Linger in Ireland for 30 Years

51500132 Dublin IRISH INDEPENDENT in English
26 Apr 90 p 1

[Article by Don Lavery]

[Text] Radioactivity from the Chernobyl accident, the world's worst nuclear disaster which happened four years ago today, will be detectable in Ireland for at least another 30 years, the Nuclear Energy Board (NEB) said yesterday.

However, it added, a monitoring programme to prevent Irish sheep meat with high levels of radioactivity, as a result of the Chernobyl accident, from reaching the consumer had been a success.

But yesterday, Irish CND said that despite the shock of Chernobyl and the shock of the Government's "ineptitude" in dealing with its results here, Ireland still had no national plan detailing how the country would cope with a future Chernobyl.

The National Co-operative Council said that, while the movement and slaughter of sheep in the North was still restricted in some areas, at no time had restrictions been imposed here. It called on the Department of Agriculture to have Irish food products assessed by an independent team of experts, such as assessors from the International Atomic Energy Agency in Vienna.

The Department of Energy said last night the national emergency plan to deal with another nuclear accident like Chernobyl was at a very advanced stage, but it would be a Government decision whether it would be published or not.

A spokeswoman said the Nuclear Accident Committee was in place and could be activated in the event of another accident. Equipment and staff resources at the NEB had been vastly improved and more monitoring equipment had been purchased.

Dr. John Cunningham of the Nuclear Energy Board said yesterday a programme had been set up, which included extensive monitoring, to ensure that sheep with high levels of radioactivity did not reach Irish consumers.

He said 46,004 sheep had been monitored at slaughter houses in 1988 and 97 per cent of them had very low levels of less than 100 becquerels per kilo. Only four animals tested had more than 600 becquerels.

NORWAY

Heavy Water Sales, Negotiations for Repurchase Detailed

Details of Agreement With Israel Reported

90P20045A Oslo AFTENPOSTEN in Norwegian
27 Apr 90 p 2

[Article by Elisabeth Holte: "Israel Is Returning the Heavy Water"—first paragraph is AFTENPOSTEN introduction]

[Text] After more than three years of tug-of-war and different political charges in relation to Norway-Israel, the agreement that Israel will return 105 tons of heavy water was signed at the Foreign Ministry yesterday morning.

It is unclear when Israel will send the heavy water back to Norway. But according to AFTENPOSTEN's information, Norway must pay an eight-digit sum for the politically so explosive heavy water shipment.

Through the years Norway has exported 440-550 tons of heavy water to many countries, but today production is

minimal. The amount manufactured per year goes mainly to laboratory study. Last year a bill was passed forbidding its export.

The 10.5 tons of heavy water are supposed to go for the most part to research. From the Norwegian point of view the main point is that by getting back half of the heavy water sold, Israel's possibilities of using the heavy water in the production of nuclear weapons will be lessened.

1959 Agreement

It was in 1959 that Israel bought 21 tons of heavy water from Norway. In the agreement of 25 February 1959 between NORATOM and Israel's Nuclear Energy Commission, it was expressly stated in the first paragraph that "Israel's government guarantees that all heavy water sold from Norway to Israel by contract is granted by the authorities involved in the two countries; it shall be used expressly to further the development of peaceful uses of nuclear energy and not for any military purpose."

The next paragraph reads:

"The Norwegian Government shall be given the opportunity to assure itself on-site that the heavy water is being used in line with this guarantee."

The agreement was signed by the then Foreign Minister Halvard Lange and the Israeli Minister Chaim Yahlil.

When it was learned that Israel was using the Norwegian heavy water for, among other things, military purposes at the Dimona factory in the Megev desert, Norway reacted strongly and tried to exercise the right of inspection—something that from the first minute Israel pointedly refused. With that the conflict broke out, with SV's [Socialist Left Party] Theo Koritzinsky as the Norwegian instigator in the demand that Israel must respect the Norwegian's right to on-site inspection guaranteed in the agreement. The alternative would be that the water would have to be returned.

The American researcher Gary Milhollin was the one who got the Norwegian authorities to move with reasonable rapidity with his assertion that Norwegian heavy water contributes to the production of 32 kg of plutonium at the Dimona factory each year, which, according to the CIA intelligence service, is being used to manufacture nuclear bombs. The only source of plutonium Israel is said to have access to is the Dimona reactor.

Israel's Atomic Weapons

The only time Norway was allowed to enter the Dimona facility was in 1961, and at that time one could confirm that the Norwegian heavy water had not been put to use. That probably first happened two years later, and since then the heavy water is said to have been systematically used in the development of the Israeli nuclear weapons.

The story of the Norwegian demand and the heavy water negotiations with Israel is long and difficult, but in October of 1988 an agreement was reached whereby

Norway would be allowed to inspect nine tons of Israel's heavy water. But this was to take place outside the Dimona facility. Nor was there any guarantee that the heavy water really was Norwegian. The agreement was, however, not approved by the Storting, which saw that the case was monstrously complicated, but felt that the agreement was not good enough.

With that, new contact was established, but little happened for all intents and purposes until before autumn. Then Israel, after meetings between Foreign Minister Thorvald Stoltenberg and Moshe Arens in New York in September, agreed to begin new talks in the heavy water matter. At the same time new intelligence reports turned up that the Dimona reactor was fully on-line. It was understood as a direct insult to Norway and the rights granted by the agreement. Just after the change in government, the talks started up again and were elevated from the civil servant level to the political plane—Secretary of State Knut Vollebaek was sent to Israel to negotiate. Now the negotiations were to center on how much of the 21 tons of heavy water were to be returned.

According to AFTENPOSTEN's information, the eight-figure sum Norway must pay for the heavy water is hard to justify in view of the 1959 agreement.

"The next best thing one could get."

Theo Koritzinsky thus characterizes the agreement which Norway and Israel have at long last arrived at concerning the disputed heavy water. But he emphasizes that it means that Israel continues to be unwilling to fulfill its responsibilities according to the 1959 agreement with Norway.

According to the draft agreement of 1988 which the Storting did not approve, Israel was to deliver nine tons of heavy water to the international nuclear energy office for inspection but with the guarantee that the heavy water was Norwegian. And even if Koritzinsky says he is "for the most part content" that such an agreement has been reached, the circumstances taken into consideration, he admits that one still cannot be certain that the heavy water is Norwegian. For that one would have to go into the Dimona factory and check the chemical and physical specifications of the heavy water there, he said.

He added that the Israelis claim that heavy water from different manufacturers is mixed.

"But on the whole I am happy with the resolution of this over three-year-old matter. I have thought for a long time that the next best solution was to have the heavy water returned so that we could reduce Israel's opportunity to produce nuclear weapons. After all, I also received support for this from Kare Willoch in the Foreign Affairs Committee," he said. Koritzinsky points out, however, that one continues to have heavy water problems with other countries, including Romania and not least France, which altogether has bought 50 tons of Norwegian heavy water.

Agreement for Return of 10.5 Tons Detailed

90P20045B Oslo ARBEIDERBLADET in Norwegian
27 Apr 90 p 13

[Article by Harald Stanghelle: "Israel Will Return 10.5 Tons of Heavy Water"—first paragraph is ARBEIDERBLADET introduction]

[Text] After intense negotiations Norway and Israel have come to an agreement in the dispute about the heavy water.

- Israel continues to refuse any form of inspection in the nuclear plant at Dimona. Norway demands the return of the heavy water and Israel has now agreed.
- 10.5 tons of heavy water will be returned to Norway, and in this way Israel will dissolve the 1959 agreement with the Norwegian Government.

ARBEIDERBLADET has learned that these are the main points in the agreement which Norway and Israel have reached. According to reliable sources, this solution has been placed before the Storting, and in Israel Prime Minister Shamir's office is said finally to have given acceptance.

With this a three-year-old struggle between Norway and Israel is probably resolved.

Complicated Negotiations

It was in February 1987 that SV's [Socialist Left Party] Theo Koritzinsky took up Norway's sale of heavy water to Israel through a question to the Foreign Ministry.

Since that time Norway has been negotiating with Israel, but without being able to obtain an on-site inspection arrangement.

Norway has referred to the fact that when we sold 20 tons of heavy water to Israel in 1959, the condition was that Norway could inspect to see whether the heavy water was being used for peaceful purposes.

The Norwegian heavy water is being used in Israel's Dimona nuclear plant in the Negev Desert. But Israel has flatly refused the demand to allow Norwegian or international experts to inspect the facility.

In October 1988 a compromise agreement was discussed according to which Norway would be allowed to inspect nine tons, but only outside the Dimona plant. This was what the then Foreign Minister Thorvald Stoltenberg was leaning toward, but strong reaction from the Storting kept this agreement from going any further.

Instead, Norway asked for new negotiations with Israel.

Astonishing

After the change in government, last autumn, the negotiations with Israel intensified.

According to reliable sources, the goal has been to put an end to this difficult matter.

Israel consistently refuses any form of on-site inspection. This means that Norway has used the full potency of a clause in the 1959 agreement which gives Norway the right to have the heavy water returned if one does not allow the opportunity to assure oneself that the precious substance is being used only for peaceful purposes.

Therefore, the negotiations have for the last months revolved around how much would be returned after 30 years. For when heavy water is concerned there is a certain amount of shrinkage, evaporation, and so on. There has been marked disagreement between Israeli and Norwegian experts.

The result was 10.5 tons, which is 1.5 more than the nine tons Israel wanted to allow for inspection outside the Dimona plant in the autumn of 1988.

According to Norwegian experts this is an acceptable result.

Political Pressure

According to ARBEIDERBLADET's information, Foreign Minister Kjell Magne Bondevik has raised the level of negotiations from ambassadorial level to a political level.

This means that Secretary of State Knut Vollebaek, who knows the Middle East very well and especially Israel from his time as a government representative, has been sent to Israel to negotiate on the heavy water matter.

According to sources ARBEIDERBLADET has been in contact with, this "upgrading" of the negotiation level has been a strongly contributing factor in the final resolution of this affair.

Israel To Sell Back 10.5 Tons

90P20045C Oslo ARBEIDERBLADET in Norwegian
28 April 90 p 10

[Article by Harald Stenghelle: "Israel Agreement Successfully Completed; Indirect Nuclear Admission"—first paragraph is ARBEIDERBLADET introduction]

[Text] In the course of one year, 10.5 tons of heavy water will be returned from Israel to Norway. Yesterday the agreement ARBEIDERBLADET referred to in yesterday's paper was signed by Secretary of State Knut Vollebaek and the Israeli Ambassador Yehiel Yativ.

The reaction in political circles was one of satisfaction over the fact that an agreement has been reached, but regret is expressed that Israel consistently refused on-site inspection.

"The agreement represents a valuable emphasis on Norway's discontent with the way Israel has handled the heavy water affair, but the agreement does not remove the impression that Israel tricked us. That is what we are reacting against throughout this protestation," says former Prime Minister Kare Willoch in a comment to ARBEIDERBLADET.

Have Nuclear Weapons

Kare Willoch says that this agreement in no way weakens the impression that Israel has developed nuclear weapons, says Kare Willoch:

"It is probable that the Norwegian heavy water has played an important role in the development of nuclear weapons," says Kare Willoch.

And both the Labor Party's Bjorn Tore Godal, and the SV's [Socialist Left Party] Theo Koritzinsky emphasize that the agreement which was entered into is the next best alternative:

"The agreement which was entered into is an indirect admission that they have a nuclear program which does not permit international inspection. This agreement places the responsibility with Israel, Koritzinsky told ARBEIDERBLADET. The SV representative is the one who has most consistently followed the heavy water case and to whom many today attribute the honor that Norway did not enter into a compromise with Israel.

"Israel's very obstinate refusal to allow international inspection unfortunately gives credence to the worst suspicions that Israel is, in fact, developing nuclear weapons at the Dimona reactor," Bjorn Tore Godal said to us.

Logical Agreement

Despite this, the agreement between Norway and Israel is supported in political circles. It was emphasized to ARBEIDERBLADET that Norway demanded inspection. This was flatly refused by Israel, and so Norway is using the next step in the 1959 agreement, namely the possibility of demanding the return of the heavy water.

"It is, of course, totally unrealistic to believe that Norway can force its way into the Israeli nuclear plant. We would rather have gained access in accordance with the 1959 agreement, but when that was refused, it became necessary for Norway to demand the return of the heavy water," says Bjorn Tore Godal.

SV's Theo Koritzinsky emphasizes that he still feels that the right of inspection should not be given up, but says that when Israel says no to inspection at Dimona "it is logical that the Norwegian Government bring the heavy water back home again."

Happy

Both Secretary of State Knut Vollebaek and Israel's Ambassador Yehiel Yativ gave the impression that they were satisfied that the matter is out of the way.

"The 1959 agreement made a different outcome possible. Norway's principal demand was to perform an on-site inspection. When that was refused, the best possible solution was to use the agreement's clause referring to the return of the heavy water," said Knut Vollebaek.

"I never doubted that the good atmosphere in the relations between Norway and Israel would make it possible to come to an agreement," said Ambassador Yativ. He did not wish to answer the question of why Israel did not want to allow Norwegian or international inspection of the Dimona reactor.

American Skepticism

The agreement will now be formally approved by the Storting and the Israeli Government, but no one expects any big surprises here. During the course of a year after the agreement is formally recognized the heavy water will be returned. It is currently in use in the Dimona reactor, and the loss must be gradual. The repurchase of the heavy water will cost Norway 12 million kroner.

Professor Gary Milhollin, an American expert in nuclear nonproliferation, says to ARBEIDERBLADET that he is very skeptical of the agreement:

"Norway should publicly announce that Israel has broken the agreement, and ask for help from the United States or the United Nations to obtain the right of inspection. Furthermore, Norway is getting far too little heavy water back. At least 18 tons of the quantity Norway sold in 1959 remain available, and Israel can continue to produce nuclear weapons with eight tons of Norwegian heavy water," said Milhollin.

Israel Agreement Points Cited

90P20045D Oslo AFTENPOSTEN in Norwegian
28 Apr 90 p 1

[Article by Elisabeth Holte: "Heavy Water Back Home in One Year"—first paragraph is AFTENPOSTEN introduction]

[Text] Both Secretary of State Knut Vollebaek and Israel's Ambassador Yehiel Yativ expressed pleasure to have the heavy water matter resolved when they signed an agreement yesterday which stated that Israel would return 10.5 tons of heavy water to Norway.

The agreement will be formally approved by the two countries' parliaments before it can be implemented. On the Norwegian side it has already been discussed in the Storting's expanded Foreign and constitutional committees, which have said that this is an agreement with which one can live. Ambassador Yativ foresaw no problems in Israel, and intimated that the agreement would be finally approved in the course of a few weeks by the country's political organs.

The reason that the agreement was postponed and not finally signed by the two parties yesterday was budgetary. According to the agreement, Norway will have to pay \$175 per kg for the heavy water, i.e., over 12 million kroner in all, and the government wants to suggest that the means be appropriated [text missing] ordinary state budget for 1991. The price Norway has agreed to pay Israel for the heavy water will lie well under the going

market price which is estimated at \$250 per kg at the very least, depending upon the quality.

Within One Year

According to the agreement, the heavy water will be sent from Israel to Norway within one year after the agreement is in effect. The reason the transfer will take such a long time is that the heavy water in question is being used today, and its use must gradually be scaled back. A second point in the new agreement is that the original 1959 agreement where Israel bought the 21 tons of heavy water from Norway now is at an end.

Give Up Inspection

For all intents and purposes this means that Norway now is giving up the demand to be allowed to inspect the Dimona reactor where the heavy water is being used, according to western intelligence sources, to manufacture plutonium for the production of nuclear weapons. In the February 1959 agreement between NORATOM A/S and Israel's Nuclear Energy Commission it states that "Israel's Government guarantees that all the heavy water sold from Norway to Israel, in line with a contract which is granted to the involved authorities in the two countries, shall be used exclusively for the fostering and further development of the peaceful use of nuclear energy, and not to pursue any military goal." The next paragraph reads as follows: "The Norwegian Government shall be given the opportunity to assure itself to its satisfaction that the heavy water is being used in line with these guarantees." Ambassador Yativ said yesterday that that revolves around different interpretations.

When Norway went in for the next best thing—to satisfy itself with the return of the heavy water and not to continue to insist on the right of inspection at the Dimona reactor—it was attributed to probable total exhaustion. It was seen that Israel would never allow either Norway or any other state to enter the reactor where, according to the American intelligence agency, the CIA, 32 kg of plutonium are produced each year. Plutonium is the basis for nuclear weapons production, and the Dimona reactor is said to be for all intents and purposes Israel's only source of plutonium.

Production Importance

According to the new agreement Israel will only return 10.5 tons, because Norwegian experts feel that 10.5 tons is the quantity which must be assumed to be remaining today of the 21 tons from 1959, assuming natural shrinkage and evaporation.

Ambassador Yativ was satisfied himself with "no comment" yesterday when AFTENPOSTEN asked how Israel will now obtain new shipments of heavy water to replace the 10.5 tons which will be sent to Norway.

Since Israel says that the heavy water, which through the years has been obtained from many manufacturers, is

mixed, the Norwegians cannot be sure that it is Norwegian heavy water that is being returned. This is, however, not really important. For Norway the main point is to get back the relevant portion of heavy water to reduce Israel's possibilities for producing plutonium and thus nuclear weapons.

The only time Norway was allowed to inspect the heavy water delivered to Israel in accordance with the 1959 agreement was in 1961, but at that time the heavy water had still not been put to use. That probably happened a few years later. Since then Israel has not allowed any form of inspection—even when the debate on Israel's use of the Norwegian heavy water came to a head more than three years ago. Since February 1987, Norway has formally requested to be allowed to undertake such an inspection.

The farthest Israel has been willing to go was in 1988 when they offered a compromise which in Norwegian was understood as "humiliating," and which stated that Norway should be allowed to see nine tons of heavy water in a container without a guarantee that it was Norwegian and without gaining entrance to inspect the production in Dimona. The Storting naturally refused to approve the agreement.

Skeptical Researchers

It was the American researcher, Gary Milhollin, and the Israeli nuclear technologist who got reasonable progress from the Norwegian authorities with their suspicions that the heavy water was systematically being used in the production of plutonium and from that for nuclear weapons in the Dimona factory.

Milhollin is critical of the agreement. "It is not at all certain that it is Norwegian heavy water which is being returned, as Israel also has bought heavy water from the Soviet Union," he said to AFTENPOSTEN.

Norway is now getting back half of the 21 tons which were sold. Milhollin points out that as adept as the Israelis are with the operation of the Dimona reactor it is not possible that the evaporation can have been so great. According to his computations barely more than three tons could have evaporated. This means that Israel will still have around eight tons of Norwegian heavy water to use in the production of plutonium.

Israel is, however, not the only country Norway has sold heavy water to. In all, the exports total 440-450 tons over the years. India, which later has also created nuclear weapons, has bought Norwegian heavy water, and the big nuclear weapons producer and weapons supplier France has bought a good 50 tons. In 1986, Norway sold 12.5 tons of heavy water to Romania.

Satisfactory Solution Reached

90P20045E Oslo AFTENPOSTEN in Norwegian
28 Apr 90 p 1

[Unattributed article: "The Agreement Is the Next Best Solution"]

[Text] The next best solution one could arrive at. In this way Theo Koritzinsky, SV [Socialist Left Party], characterizes the agreement which Norway and Israel have arrived at at long last concerning the disputed heavy water. But he emphasizes that it means that Israel will continue not to be willing to follow up on its responsibilities according to the 1959 agreement with Norway.

According to the draft agreement of 1988, which the Storting did not approve, Israel was to deliver nine tons of heavy water to the International Nuclear Energy Office for inspection but without a guarantee that the heavy water was Norwegian. And even though Koritzinsky says "he was very satisfied on the whole" that such an agreement was reached, taking the circumstances into consideration, he admits that now one would not know whether this was really Norwegian heavy water. For that it would be necessary to go into the Dimona factory and check the chemical and physical specifications of the heavy water on the spot, he said.

"But on the whole I am content with the solution of this over three-year-old case. I have thought for a long time that the next best solution was to get the heavy water returned, so that we could reduce Israel's possibility of producing nuclear weapons, and I got support from Kare Willoch in the Foreign Affairs Committee," he said. Koritzinsky points out, however, that heavy water problems still persist with other countries, among others, India, Romania, and not least France, which all in all has bought 50 tons of Norwegian heavy water.

Storage Site for Heavy Water Determined

90P20045F Oslo AFTENPOSTEN in Norwegian
28 Apr 90 p 1

[Article by Ulf Andenaes and Harald Brynildsen: "For Norwegian Research"]

[Text] The heavy water which is being repurchased from Israel can be used in the two test reactors which the Institute for Energy Technology operates in Norway says director Knut Gussgard in the State Nuclear Inspection Office to AFTENPOSTEN. One of the reactors is located in Kjeller, the other in Halden.

"It is a job for the State Nuclear Inspection Office to make sure that the heavy water from Israel is received safely. For all intents and purposes, the transport arrangements are that the heavy water will be delivered in containers and picked up in Israel," says Gussgard.

"Today heavy water's normal use is as a so-called dampener in reactors, to slow down the neutron particles which cause the atoms to divide in a chain reaction. The

Norwegian heavy water in Israel is feared to have been used to produce plutonium for nuclear weapons."

At the Halden reactor the heavy water could be used in the usual manner, which accommodates a research program for the study of reactor fuel.

End of Norwegian Heavy Water

"Today is the end of production of heavy water in Norway," says sales chief Paul Henrik Aas at the Industrial Chemical Division of Norsk Hydro to AFTENPOSTEN. "Heavy water has not been produced in the past year, something which is linked with the cutbacks of employees at Rjukan."

The Institute for Energy Technology at Kjeller says that for the moment there are no plans for the use of the heavy water from Israel. It can either be used for research or be stored, it was said.

The test reactor at Kjeller is capable of barely one percent of the [normal] activity of a nuclear energy plant, while the Halden reactor's capability is one percent.

Heavy Water Not Dangerous

Administrating director Nils Godfred Aamodt at the Institute for Energy Technology at Kjeller says to AFTENPOSTEN that heavy water is in no way dangerous. But it has a market value of presumably around 1.5 million kroner per ton.

"Is 10 tons of heavy water a great deal?"

"For scientific purposes it is a lot. Different laboratories want 10-20 or even 50 kg. But for technological purposes, as for example a Canadian reactor, the amount is modest. The Canadians have hundreds of tons of heavy water in reactors."

More on Return of Heavy Water

90P20045G Oslo *NATIONEN* in Norwegian 28 Apr 90 p 2

[Article from NTB [Norwegian Wire Service]: "Norway Will Get Heavy Water Back"]

[Text] (NTB [Norwegian Wire Service]—Knut Eivind Straumme): Within one year the 10.5 tons of heavy water will be returned from Israel to Norway. This was finalized when the parties signed the draft for the new heavy water agreement on Friday. Secretary of State Knut Vollebaek in the Foreign Ministry and Israel's Ambassador to Norway Yehiel Yativ were markedly relieved to be done with a common load.

With this Norway will receive back half of the 21 tons of heavy water which was sold to Israel in 1959. At the same time the old agreement will be dissolved. The price tag is a little over 12 million kroner, which is seen as a favorable price from the Norwegian point of view.

"We are very happy with this agreement," said both Vollebaek and Yativ after the papers were signed. They were both agreed that the heavy water strife had been a problem for both parties.

Deny Breaking the Agreement

Shrinkage due to use is said to be the reason that the amount of heavy water has been cut by half over 30 years. The heavy water will be bought back because Israel has refused any form of inspection at the nuclear plant in Dimona, where the water has been in use. The contract from 1959 states that Norway will have the right of inspection to be sure that the heavy water is only used for peaceful purposes.

Demand Explanation?

MP Theo Koritzinsky (SV) [Socialist Left Party] thinks that Norway should demand an explanation from Israel on whether the heavy water was used only for peaceful purposes. Ambassador Yativ does not wish to comment on whether Israel will provide such an explanation.

The heavy water will be returned within one year after that agreement has been put into effect. It will be stored as a supplement to the research reactors in Halden and Kjeller.

Agreement Seen Next Best Solution

90P20045H Oslo *AFTENPOSTEN* in Norwegian 28 Apr 90 p 2

[Unattributed article: "The Agreement Is Next Best Solution"]

[Text] "The next best thing one could achieve." SV's [Socialist Left Party] Theo Koritzinsky characterizes as such the agreement which Norway and Israel have finally arrived at concerning the disputed heavy water. But he emphasizes that it implies that Israel still is unwilling to fulfill its responsibilities according to the 1959 agreement with Norway.

According to the draft agreement from 1988, which the Storting did not approve, Israel was to deliver nine tons of heavy water to the international nuclear energy office for inspection, but without any guarantee that the heavy water was Norwegian. And even if Koritzinsky says he is "for the most part satisfied" that such an agreement has been made, the circumstances taken into consideration, he admits that one cannot really know if this really is Norwegian heavy water. For that one would have to go into the Dimona plant and check the chemical and physical specifications of the heavy water there, he said. He added that the Israelis themselves claim that heavy water from different supplier countries is mixed in.

"But for the most part, I am happy with the resolution of this over three-year-old matter. I have thought for a long time that the next best solution would be to get the heavy water returned, so that we could reduce Israel's opportunity to produce nuclear weapons, and, after all, I also

got support in this from Kare Willoch in the Foreign Affairs Committee," he said. Koritzinsky pointed out, however, that one still has problems concerning heavy water with other countries, among others, Romania and not least France which in all has bought 50 tons of Norwegian heavy water.

Paper Views Israel's Nuclear Capability

90P200451 Oslo ARBEIDERBLADET in Norwegian
30 Apr 90 p 2

[Editorial: "Israel's Bomb"]

[Text] The agreement which finally was reached between Norway and Israel on the heavy water matter was met with resigned satisfaction in the political sphere. Resignation because Norway's demand for inspection was flatly refused by the Israelis. Satisfaction because the agreement was no jaunting compromise. The Norwegian Government is taking the consequences of Israel's breaking of the agreement, and demands the return of the heavy water.

It was good and proper work by Foreign Minister Kjell Magne Bondevik and Secretary of State Knut Vollebaek in this matter. They have stood on the principles of return and have not allowed themselves to be tempted by a compromise which would have been equally as tempting as it would have been embarrassing for Norway.

But the individual politician who more than any other fought for the principles in the heavy water case was Theo Koritzinsky. This matter is an example of what in the best case can happen when an individual politician refuses to give in to the political hierarchy, and consistently sticks to his principles. When the final story about the heavy water dispute between Norway and Israel is written, Theo Koritzinsky will be tied to the story as the one politician who slowly but surely got the rest of the political environment to go along with his principles.

A burden in the relations between Norway and Israel is gone. Just the same, there is no big enthusiasm to be felt. No natural joy. It is not just the foreign minister's promise of teetotaling that keeps that champagne corks from popping.

This agreement unfortunately shows the unpleasant truth behind the Norwegian heavy water in the Israeli experts' hands. As Kare Willoch and others along with him point out: The agreement does not weaken the impression that Norway has contributed to the Israeli nuclear bomb.

When Israel refuses to fulfill an extremely clear agreement for inspection with a country which has the best contacts with the young Jewish state, Israel is saying at the same time in clear language that they have used the Norwegian naivete and weakness for 30 years for their nuclear armament [purposes].

The Norwegian-Israeli agreement says that in clear words. Norwegian politicians say clearly: Norway has

made an important contribution toward the introduction of mass destructive weapons in the world's least calm corner. That is little to be proud of.

There are those who say that Norway should not have entered into this agreement. That we should have protested more and more publicly. That we should have asked the United States and the United Nations for help. And that we should not have accepted the return of only half of the heavy water.

We do not agree. This is not an agreement where we once again are being tricked by a nation which is smarter than we are. We say straight out that Israel has broken an agreement. We say just as clearly that this reinforces our suspicion that they are developing nuclear weapons. And we make it clear, in an embarrassing scene, that we will not go along any longer. We are buying the heavy water back.

We give up—and know that we would not get any further if we were to register a protest in the international community. We recognize unforgivable guilt in the Middle East's weapons race. Our only hope is that the weapons we have made our contribution to will never be used.

Lack of Oversight Faulted

90P20045J Oslo DAGENS NÆRINGSLEV
in Norwegian 30 Apr 90 p 2

[Unattributed article: "No Perspective on Heavy Water"]

[Text] Some 450 tons of Norwegian produced heavy water was exported from the 1930's until the Brundtland government placed a ban on its export in 1988. The Foreign Ministry has, however, no exact perspective on what became of the heavy water once it reached its purchasing nation.

There is still concern that Norwegian heavy water could have been used in nuclear weapons production. The new government in Romania is said to have confirmed that 12.5 tons of Norwegian heavy water were resold to India in 1986. Foreign Minister Bondevik has warned that the Norwegian authorities will follow up on this matter in all seriousness. He feels that it will be in both the Norwegian and the Indian interests to get a clarification that the heavy water should only be used for peaceful purposes.

Norway has, however, no formal right to inspection or to demand the return of the heavy water from India. It can, therefore, be most uncertain what can be accomplished. An earlier case has contributed little grounds for optimism.

In 1988 a criminal investigation was set in motion because 15 tons of Norwegian heavy water, which was legally exported and should have arrived in West Germany, with a large degree of probability was diverted to India. The shipment occurred in 1983. Neither criminal

investigation nor political pressure in the matter has yielded any ostensible results, two years after the matter was raised.

The Foreign Ministry's political leadership counts the heavy water relationship to Israel as a small victory. A short time ago it was agreed that Norway would get back half of the heavy water.

MP Theo Koritzinsky (SV) [Socialist Left Party] has been heavily involved in the heavy water matter. He feels that Norway must use what forcible means we have to reach some agreement with India.

—Through gentle diplomacy we will probably achieve just as little as in the case from 1983-86, namely nothing; says Koritzinsky.

He feels Norway must demand assurances from India that the 27 tons of Norwegian heavy water which they harbor there is being used for peaceful purposes, and at the same time Norway should demand the Norwegian right of inspection.

—If we don't reach some such agreement, we should abrogate India's status as a Norwegian main trading partner, he says.

Koritzinsky feels that on the whole the Norwegian export of 150 tons of heavy water to France is probably the worst of all the instances. According to the SV representative, this export is not accompanied with any clause that the heavy water must be used only for peaceful purposes. Koritzinsky figures it as totally unlikely that the reactor which the French in their time built in Israel was delivered totally "dry." (NTB) [Norwegian Wire Service]

Sale to Israel Recounted

90P20045K Stavanger STAVANGER AFTENBLAD
in Norwegian 30 Apr 90 p 1

[Unattributed article: "450 Tons Sold Abroad"]

[Text] Oslo (NTB) [Norwegian Wire Service]: Some 450 tons of Norwegian produced heavy water were exported from the 1930's until the Brundtland government placed a ban on its export in 1988. The Foreign Ministry has, however, no exact knowledge of what became of the heavy water once it reached its purchasing nation.

There is still concern that Norwegian heavy water could have been used in nuclear weapons production. The new government in Romania is said to have confirmed that 12.5 tons of Norwegian heavy water were resold to India in 1986. Foreign Minister Bondevik has warned that the Norwegian authorities will follow up on this matter in all seriousness. He feels that it will be both in the Norwegian and Indian interests to get a clarification that the heavy water should only be used for peaceful purposes.

Secretary of State Knut Vollebaek in the Foreign Ministry promises that this matter will taken up very quickly.

—First I will approach the Indian Embassy in Oslo, says Vollebaek to NTB.

Norway has, however, no formal right of inspection or to demand the return of the heavy water from India. In addition, Vollebaek says that there is a statute of limitations of five years in such cases and that it is therefore impossible to punish persons who have broken Norwegian law. It can therefore be most uncertain what can be accomplished. An earlier case has contributed little grounds for optimism.

In 1988 a criminal investigation was set in motion because 15 tons of Norwegian heavy water, which was legally exported and should have arrived in West Germany, with a large degree of probability was diverted to India. The shipment occurred in 1983. Neither criminal investigation nor political pressure in the matter has yielded any ostensible results, two years after the matter was raised.

The Foreign Ministry's political leadership counts the heavy water relationship to Israel as a small victory. Norway exported 21 tons of heavy water to Israel in the 1950's and 1960's, against guarantees that it would be used only for peaceful purposes. A short time ago it was agreed that Norway would get back half of the heavy water.

As early as in December 1987 the Ministry of Trade made public an explanation for the sale and export of Norwegian heavy water. The producer of heavy water in Norway, Norsk Hydro, has produced approximately 450 tons, of which almost all was exported to a total of 36 recipient countries.

Ten countries have bought heavy water in such quantities that it could be used in reactors. They are France (151 tons), Great Britain (104), Sweden (82 tons), West Germany (28 tons), Israel (21 tons), Japan (16 tons), Canada (14 tons), Romania (12.5 tons), Belgium (7 tons), and the Netherlands (2 tons).

Among the countries which have received lesser quantities of heavy water is South Africa, which has received six to seven kg of heavy water figured to be for research purposes.

The state nuclear energy industry in Sweden has informed us earlier that 78 of the 82 tons of heavy water which Sweden has bought from Norway have been sold to other countries. West Germany and Canada are among the purchasers of Norwegian heavy water from Sweden, and two of the sales from Sweden to Canada—which together made up eight tons—were executed without Norwegian permission.

MP Theo Koritzinsky (SV [Socialist Left Party]) has been heavily involved in the heavy water matter. He feels that Norway must use what forcible means we have to reach some agreement with India.

—Through gentle diplomacy we will probably achieve just as little as in the case from 1983-86, namely nothing; says Koritzinsky.

He feels Norway must demand assurances from India that the 27 tons of Norwegian heavy water which they harbor there is being used for peaceful purposes, and at the same time should demand the Norwegian right of inspection.

—If we don't reach some such agreement, we should abrogate India's status as a Norwegian main cooperative country, he says.

Koritzinsky demands further that Norway immediately freeze regime destined goods and financial contributions for India until a satisfactory solution is reached. He emphasizes that Norway should use only such parts of the contribution as tools for applying pressure—not those contributions which go directly to projects for the population.

Koritzinsky feels that on the whole the Norwegian export of 150 tons of heavy water to France is probably the worst of all the instances. According to the SV representative this export is not accompanied with any clause that the heavy water must be used only for peaceful purposes. Koritzinsky figures it as totally unlikely that the reactor which the French in their time built in Israel was delivered totally "dry." (NTB)

Norwegians in Agreement

90P20045L Oslo AFTENPOSTEN (Evening Edition)
in Norwegian 27 Apr 90 p 2

[Article by Harald Stanghelle: Tight Norwegian Agreement—first three paragraphs are AFTENPOSTEN introduction]

[Text]

Million Figure for the Heavy Water

- Norway must pay a two-figure million [kroner] figure for the 10.5 tons of heavy water which Israel at last has agreed to return to Norway after three years of political problems because the Israelis are said to have used the heavy water in the production of nuclear weapons. The agreement was signed today in the Foreign Ministry.
- The next best thing one could get, says SV's [Socialist Left Party] Theo Koritzinsky, who for more than three years has been the instigator in the politically inflamed heavy water matter. But he points out that the agreement alludes to the fact that Israel continues to refuse to honor their responsibilities according to the 1959 agreement.

The Norwegian occupation story says that "heavy water" is a concept in Norway. Norwegian saboteurs kept Nazi Germany from using heavy water to develop a nuclear bomb.

When a former Israeli nuclear technician, Mordechai Vanunu, in the autumn of 1986 stepped forward in THE SUNDAY TIMES and said that Israel had developed its own nuclear warheads in the Dimona reactor, there were some who began to ask whether Israel had used Norwegian heavy water to accomplish this.

Old Agreement

Among them was the SV's Theo Koritzinsky who took up the matter in the Storting.

Earlier in 1959 Norway had sold 20 tons of heavy water to Israel. The sales agreement gives Norway the right to that which some call "on-site inspection" to see that the heavy water is only being used for peaceful purposes. If Norway finds that this condition is not being fulfilled they have the right to demand the return of the heavy water.

But Norway carried out only one inspection. It was in 1961, and one could only state that the heavy water had not yet been put to use.

This happened probably two years later. Earlier in 1963 the nuclear reactor in Dimona in the Negev desert was brought on line. There was, however, no Norwegian inspector sent out to inspect the use of the heavy water.

The whole heavy water [matter] was "forgotten."

Nuclear Weapons

Israel's nuclear weapons arsenal is based upon plutonium. And the only known source of plutonium that country has access to is the Dimona reactor. But to achieve the necessary reaction the reactor needs the substance we know as heavy water.

It is not the heavy water itself, but the use of it which can create the by-product plutonium—which still can be misused in the development of nuclear weapons.

Thus the Norwegian heavy water, extremely simply put, can be coupled to the Israeli nuclear weapons arsenal.

Demand

From 1967 on until the autumn of 1988 Norway negotiated with Israel over the right to inspect the heavy water.

The result was the so-called compromise agreement which gave Norway the right to inspect nine tons of heavy water, but outside of the Dimona reactor. Critical experts said that it did not mean anything at all, and that Norway was in the process of legitimizing both the Israeli nuclear development—and the breaking of the agreement with Norway.

In autumn of 1988 the Storting refused this compromise agreement, and asked the Foreign Ministry to enter into new negotiations with Israel.

No Compromise

This is the final outcome.

Now [we would] rather Israel not let anyone inspect the country's nuclear facility, but Norway will enforce [the part of the agreement] that Israel must go ahead with part two of the 1959 agreement, namely to return the heavy water.

Therefore there is no compromise which would make Norway appear weak in the face of broken agreements in sensitive questions.

What the Norwegian heavy water from 1959 on has been used for no Norwegian authority wants to know. The opportunity was abused long ago. But one does want to be sure that a large and important part of the heavy water can no longer be used in a process which has as its goal the creation of material for nuclear arms production.

Heavy Water to Kjeller for Research

90P20045M Oslo AFTENPOSTEN in Norwegian
7 Jun 90 p 6

[Article by Harald Brynildsen: "Heavy Water To Go to Kjeller"]

[Text] It has now been decided that the Institute for Energy Technology at Kjeller will store the heavy water Norway is buying back from Israel. Technical director Jon Olav Berg at the institute says to AFTENPOSTEN that the storage should not be a problem. Already some hundreds of kg of heavy water have been stored for Kjeller's own use, and must therefore have such safe-keeping possibilities as international rules dictate. This means, among other things, that the containers of heavy water will be locked in a building and fenced in. "We will take good care of the heavy water," assured director Berg.

"It is a question only of the quantity we buy back—10.5 tons are something much more than the institute's own storage facility capacity."

Director Berg is not bursting with curiosity over when the shipment will take place, but assumes it will take some time before the heavy water arrives.

It is assumed that Norway will pay approximately 12 million kroner for the disputed goods.

Illegal Transfer of Norwegian Heavy Water to India Reported

12-Ton Sale to India

90P20047A Oslo ARBEIDERBLADET in Norwegian
28 Apr 90 p 10

[Article by Harald Stanghelle: "New Heavy Water Revelations—12 Tons to India"—first paragraph is ARBEIDERBLADET introduction]

[Text] The 12.5 tons of heavy water which Norway sold to Romania in February 1986 were illegally resold to India's nuclear weapons program.

According to what ARBEIDERBLADET has reason to believe, the new authorities in Bucharest can document that the Ceausescu regime used the Norwegian heavy water in a trade to obtain western currency.

"No comment," say both Secretary of State Knut Volleback in the Foreign Ministry and First District Attorney Anstein Gjengedal of the Okokrim [economic crime] group.

"The only thing I can add is that the affair is under investigation," says Gjengedal to ARBEIDERBLADET.

According to what ARBEIDERBLADET knows the investigation will be conducted by the security police's most experienced people.

Sale in 1986

In 1985 Romania tried to buy Norwegian heavy water. And in February of 1986 the Ministry of Trade granted an export licence for 12.5 tons of heavy water.

"A so-called explanation of final use from the Romanian Ministry for Foreign Trade was given, and it was stated that the heavy water was to be used in a nuclear reactor which was supposed to be brought on line under international inspection," says press spokeswoman Sigrid Romunseth to ARBEIDERBLADET.

What the Norwegian authorities did not know, and did not investigate, was that the actual nuclear reactor was not to be put into service before 1995, and that Canada, which builds the reactors, was at that point to furnish the plant with heavy water.

In contrast to Norway, Canada refused to sell one single liter of heavy water to Romania before the reactor was to be brought on line.

Romania signed the nonproliferation agreement, and has obligated itself to allow international inspection of its nuclear reactors.

No to Norway

When the uncovering of the Norwegian heavy water scandals began to roll three years ago, the Norwegian authorities contacted Romania and asked to be allowed to inspect.

According to ARBEIDERBLADET's information, the Romanians replied that inspection of nuclear reactors before they are brought on line was not allowed—and that had not yet happened.

When Norway pressed to be allowed to perform an international inspection, Romania refused to answer.

That was the situation when the Romanian dictatorship crumbled in December. In January, Lasse Seim traveled

to Romania as Norway's first representative after the revolution. Among his many tasks was to investigate where the Norwegian heavy water issue stood. Strong speculations asserted that Romania had sold the heavy water to Israel or India. The Romanian authorities promised Lasse Seim that they would investigate the matter.

ARBEIDERBLADET has reason to believe that the investigation shows that India bought the heavy water which came from Norway in 1986.

India's Nuclear Bomb

India has developed nuclear weapons, and the country has obviously not signed the nonproliferation agreement.

It is known that the Indians periodically have had problems obtaining enough heavy water for their nuclear reactors. When inspection of sales of heavy water became more stringent, India went out on the gray nuclear market to obtain some heavy water.

In Norway it is extremely well known that in 1983 Norsk Hydro sold 15 tons of heavy water to West German businessman Alfred Hempel who resold it to India. Norwegian police investigations have followed the heavy water's trail to Bombay, but officially India denies that they received the heavy water.

"As early as a year ago we asked for Indian assistance in finding out what happened to the heavy water in Bombay, but the Indians have answered neither our inquiry, nor communiques through the foreign service," says First District Attorney Gjengedal to ARBEIDERBLADET.

Halt of Aid to India Proposed

90P20047B Oslo ARBEIDERBLADET in Norwegian
28 Apr 90 p 10

[Unattributed article: "Stop Aid to India"—first paragraph is ARBEIDERBLADET introduction]

[Text] The Socialist Left Party wants to take up the matter in the Storting immediately. The part of the Norwegian contribution which goes to the country's official authorities must be stopped until India has given a satisfactory explanation in this heavy water affair.

Theo Koritzinsky, SV [Socialist Left Party], said this to ARBEIDERBLADET in light of the information we now present on Romania's resale of Norwegian heavy water to the nuclear power India.

Subversions

Theo Koritzinsky asks whether Norway can have a principle cooperative country, such as India is today, which subverts Norway's obligations with relation to the nonproliferation of nuclear weapons.

Representative Kare Willoch was prime minister when Norway sold the disputed consignment of heavy water to Romania:

"If the information concerning the resale to India is accurate, I can show that it is clearly in violation of the provisions for the sale," says Kare Willoch.

Not Strong Enough

On the question of whether this and other heavy water cases show that the then Norwegian Government was concerned far too little with overseeing the export of the heavy water, Kare Willoch answers:

"I will not repudiate the intimation that we should have taken a tougher line. It seems clear that we put too much faith in assurances from unreliable people," the former Norwegian prime minister said.

Norway Called Naive, Tricked

90P20047C Oslo ARBEIDERBLADET in Norwegian
28 May 90 p 5

[Article by Harald Stanghelle: "Naive Norway's Contribution"—first paragraph is ARBEIDERBLADET introduction]

[Text] On two occasions, in 1983 and in 1986, Norway contributed to the Indian nuclear program. Both instances revolve around heavy water which was illegally sold to India—27.5 tons in all.

Indian authorities have until now refused to answer Norway's questions on these heavy water shipments. A press announcement denying that India received 15 tons of Norwegian heavy water via the German businessman Alfred Hempel in 1983 is India's only answer.

When the Norwegian prosecuting attorneys approached the Indian Justice Ministry to ask for assistance in further criminal investigation, no answer was received. At that time the Norwegian criminal investigators had followed the heavy water the long distance from Oslo to Bombay.

Tricked

In 1983 the Ministry of Trade gave Norsk Hydro an export permit for 15 tons of heavy water. Hydro said that it was the firm of the West German businessman Alfred Hempel which was the buyer, and that it would be used in West Germany.

No one investigated the now dead Hempel's concern any further, and neither Norsk Hydro nor Norwegian authorities showed any special interest in the heavy water's fate. Quite the opposite was shown by independent researchers and later also by a number of journalists.

When the snowball began to roll, it was learned that the 15 tons of heavy water never saw German soil. From Oslo it was first flown to Switzerland, and then on to Bombay in India.

Investigators from the security police have laboriously patched together the heavy water's route. According to what ARBEIDERBLADET has learned there is no doubt that the trail ends in India. But the Indians do not respond to the matter. And here in Norway the prosecuting attorneys have no clue that anyone was for certain involved in the illegalities.

Probably both Hydro and the Ministry of Trade were tricked and were the victims of their own naivete and lack of expertise.

Romania Next

In 1986 Ceausescu's Romania bought 12.5 tons of heavy water from Norway, without the Norwegian authorities posing the bold question of what the heavy water would be used for. Canada refused to sell heavy water to Romania, which in contrast to India signed the nonproliferation treaty for nuclear material, and is a member of the International Atomic Energy Agency (IAEA).

But when Norway began to be interested in where the heavy water had ended up, the Romanians refused to allow international inspection and did not answer the question of what the heavy water was being used for.

In the media it had long been speculated that Romania sold the heavy water to obtain sorely needed Western currency, either to Israel or India.

Some weeks ago ARBEIDERBLADET was able to uncover the fact that the new authorities in Romania have assured the Norwegian authorities that it was India that illegally bought the Norwegian heavy water.

In Production

Apparently India had developed its nuclear bomb long before Norwegian heavy water rested in the Indian reactors. The country is not a member of the IAEA, and it has not signed the nonproliferation treaty. Besides, India has a civilian nuclear energy program, and also has a certain capacity to produce heavy water on its own.

But according to the Norwegian journalist Arild Aspoy, who in the recently presented book "Family Jewels" took the illegal, international heavy water trade to task, at a certain point in time India lacked heavy water for its ambitious nuclear program.

The country's reputation as a nuclear power prevented it from openly and legally buying the required heavy water, therefore it had to go out on the black market.

And there Norway stood smack in the middle.

If India should use any of its nuclear weapons it will surely be said that Norway carries a great responsibility. The Norwegian naivete and the lack of supervision with the export of heavy water are important threads in the web which made this possible for India.

Bondevik Confirms Resale to India

90P20047D Oslo ARBEIDERBLADET in Norwegian
30 May 90 p 1

[Unattributed article: "Bondevik Confirms"—first paragraph is ARBEIDERBLADET introduction]

[Text] Foreign Minister Kjell Magne Bondevik confirms in this weekend's ARBEIDERBLADET issue that 12.5 tons of Norwegian heavy water were resold to India. The purpose for which the heavy water is being used in India is not known, but the Norwegian authorities want clarification on that.

It is now clear that Norway exported 450 tons of heavy water abroad from 1930 on until the ban on its export in 1988. The Foreign Ministry has proof of the heavy water exports according to ARBEIDERBLADET's discoveries made before the weekend. There is concern once again that Norwegian heavy water could have been used in nuclear weapons production. The new regime in Romania is said to have confirmed that 12.5 tons of Norwegian heavy water were resold from there to India in 1986. Foreign Minister Bondevik has warned that the Norwegian authorities will follow up on this matter in all seriousness.

India Scandal

Secretary of State Knut Vollebaek in the Foreign Ministry promises that this matter will be taken up very quickly.

"I will first approach the Indian Embassy in Oslo," said Vollebaek to NTB [Norwegian Wire Service].

Norway has, however, no formal right of inspection or to have the heavy water returned from India. In addition, Vollebaek said that there is a statute of limitations of five years in such cases, and that it is not possible to punish any people who may have broken Norwegian law. It could therefore be most uncertain what can be achieved. An earlier case has hardly contributed to an optimistic point of view.

In 1988 a police criminal investigation was set in motion because 15 tons of Norwegian heavy water, which was supposed to be legally exported to West Germany, with a high degree of probability ended up in India. The delivery occurred in 1983. Neither criminal investigation nor political pressure in this matter has yielded any ostensible results, two years after the matter was raised.

Small Victory

The Foreign Ministry's political leadership, however, counts the heavy water situation with Israel as a small victory. Norway exported 21 tons of heavy water to Israel in the 1950's and 1960's against guarantees that it would be used for peaceful purposes. A lack of inspections awoke political disquiet in Norway. A short time ago it was agreed that Norway would get back half of the heavy water.

Perspective

As early as in December 1987 the Ministry of Trade made public an explanation for the sale and export of Norwegian heavy water. The producer of heavy water in Norway, Norsk Hydro, has produced approximately 450 tons, all of which were exported to 36 recipient nations.

Ten countries bought heavy water in such quantities that it could be used in reactors. They are France (151 tons), Great Britain (104 tons), Sweden (82 tons), West Germany (28 tons), Israel (21 tons), Japan (16 tons), Canada (14 tons), Romania (12.5 tons), Belgium (7 tons), and the Netherlands (2 tons).

Norsk Data Computers Used in Indian Nuclear Program

90P20046A Oslo DAGBLADET in Norwegian 4 May 90 p 5

[Article by Arild Aspoy: "Disc Military Power—Six Computers From Norsk Data Operate in India's Largest and Most Important Nuclear Plant, BARC"]

[Text] The Norwegian exporter and technology supplier has acted in conflict with the intentions of the international agreements for the nonproliferation of nuclear weapons.

This information was confirmed by Norsk Data and by the Foreign Ministry.

Press spokesman Bjorn Kanavin of the Foreign Ministry says to DAGBLADET that computers were sold with a final use agreement which guaranteed that the machines would not be housed anywhere other than with the official purchaser, which was BARC. He will not say whether the Foreign Ministry was informed that BARC is India's largest plant for plutonium production.

Director Soren Voigt of Norsk Data says that the company has supervised the computers as recently as last year:

—But I have no estimation for how much these machines are used to produce plutonium.

Would Have Discouraged

One of the Foreign Ministry's experts in this area says that he would have discouraged an export license for BARC because the machines must be assumed to be used for nuclear production.

In all, six computers of the type ND 100 and ND 500 worth close to 15 million kroner were sold directly to India's largest nuclear plant in 1983 and 1984: Bahba Atomic Research Center (BARC). This plant is not under international control. The plant is India's largest producer of plutonium for nuclear weapons. The Norwegian shipment to the plant is in conflict with the intentions in the international agreements Norway has signed which obligate us not to contribute to the proliferation of nuclear weapons.

40 Kilograms of Plutonium

ND's machines make up one of the most important tools in BARC. The facility has a production capacity of 40 kg of plutonium per year, enough for four nuclear bombs.

According to BARC's own yearly reports, ND's machines deliver, together with an American system, "all datapower to scientists and engineers at the center."

In the past five or six years Norsk Data has sold some 60 computers to the nuclear power India. The majority of the machines are produced in Norway. The rest are produced under license by an Indian firm ECIL (Electrical Corporation of India).

This firm is the owner of the nuclear center BARC and the producer of the Indian nuclear reactors. In the eighties ECIL got the rights to ND's technology in connection with a technology sharing agreement for 120 million kroner. Included in this agreement with ECIL, which was cleared at a high political level in the Foreign Ministry, there is a provision that the machines could not be used in nuclear plants.

Refused

According to what DAGBLADET has learned, the Foreign Ministry is aware of what has happened in connection with an application from India's arch enemy, Pakistan, to try to buy Norwegian computers.

Among the scientific institutes which are named as recipients of the equipment were nuclear plants. Pakistan's application was therefore refused. The refusal, together with a reevaluation of India's status after discoveries of illegal purchases of heavy water, led to a stricter attitude toward India.

The BARC nuclear plant has also in the last years tried to buy computers in Norway, but has been turned down. According to sources at ND, the Foreign Ministry's grounds for refusal were that the machines were to be used for nuclear purposes.

Press spokesman Kanavin in the Foreign Ministry says that the refusal was because the computers, which are up-to-date, were more advanced than those which were sold earlier in the eighties.

Nuclear Bomb Factory

BARC is the main component in Indian nuclear weapons production. It is in Trombay outside of Bombay. The factory consists of two nuclear reactors in addition to a building for fabricating plutonium, which makes up the core of a nuclear bomb.

The two reactors in BARC are CIRUS and DHRUVA; CIRUS was India's first nuclear reactor. The country produced the plutonium here which was used in 1974 when the country detonated its first nuclear bomb. Both this reactor and the other, DHRUVA, which was

brought on-line in 1985, are operated outside of international control. The same holds true for buildings for the fabrication of the plutonium the two reactors produce.

The Indian nuclear industry consists of a line of nuclear reactors and other buildings. Some of them are used exclusively to produce electricity, and are under control of the international nuclear energy office. Other buildings are used for nuclear bomb production—and are outside of International Atomic Energy Agency control.

UNITED KINGDOM

Dounreay Fast Reactor Shut Down Because of Leak

51500126 London *THE DAILY TELEGRAPH*
in English 8 May 90 p 4

[Text] The prototype fast nuclear reactor at Dounreay in Caithness has been shut down because of a leak and will remain out of action until the fault has been inspected.

Experts were investigating a small discharge of liquid sodium metal from one of its three secondary cooling circuits yesterday.

The circuits exchange heat between a primary circuit of sodium, which comes in contact with the hot nuclear fuel, and a water circuit used to generate steam for power generation.

A team has been waiting until the reactor had cooled sufficiently for an inspection. A spokesman at Dounreay said the sodium which escaped was not radioactive.

"The small leak occurred on April 26 and the reactor was shut down by manual tripping. But everything has been pretty hot since and we've had to wait till it cooled down to mount an investigation.

"We don't know exactly what the problem is but we hope to know the answers in the next few days," he added.

The leak was detected when smoke appeared around a reheater—part of a heat exchanger transferring heat from a secondary sodium circuit to a tertiary water circuit.

Dounreay's last leak was five years ago and was traced to a faulty weld in a tube. That cost £1 million to put right and the latest incident could be more expensive.

The reactor was due to start a statutory three-month shut-down in mid-June. It may be brought forward if the leak proves difficult to detect. Otherwise, it could be run at two-thirds power, using only two of three cooling circuits.

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